

CHAPTER 4

INSTRUCTIONS FOR PREPARING CLOSURE AND POST-CLOSURE COST ESTIMATES

Owners and operators must prepare detailed written estimates of the current costs of closing their facilities and, for disposal facilities, the costs of monitoring and maintaining them after closure.¹ The cost estimates must be based on the activities described in the closure and post-closure plans. These cost estimates are used to determine the level of financial assurance required.

This chapter discusses the assumptions to be used in developing estimates as follows:

- Section 4.1 -- Applicability of cost estimating requirements;
- Section 4.2 -- Basic rules for preparing cost estimates;
- Section 4.3 -- Revising cost estimates to reflect changes in closure and post-closure plans;
- Section 4.4 -- Annual adjustments for inflation; and
- Section 4.5 -- Documentation for cost estimates.

This chapter supplements the information included in Guidance Manual: Cost Estimates for Closure and Post-Closure Plans (Subparts G and H) (hereinafter referred to as Cost Estimate Guidance Manual), EPA #530-SW-86-036, OSWER Policy Directive Number 9476.00-6. That document includes sample worksheets outlining the cost components that should be included in a closure or post-closure cost estimate for various process types. In addition, that document presents unit costs (or ranges of costs) for each of the activities.

4.1 APPLICABILITY OF COST ESTIMATING REQUIREMENTS

Exhibit 4-1 summarizes the applicability of the cost estimating regulations as follows:

- (1) Owners or operators of ALL TSDFs with the exception of Federal or State government agencies, must prepare closure cost estimates based on the closure plans.²

¹ 40 CFR 264.142(a), 264.144(a), 265.142(a), and 265.144(a).

² 40 CFR 264.140 and 265.140.

EXHIBIT 4-1
APPLICABILITY OF CLOSURE AND POST-CLOSURE COST ESTIMATES

Process Type	Closure Cost Estimate	Contingent Closure Cost Estimate	Post-Closure Cost Estimate
<u>Permitted facilities</u>			
Container	X		
Tank with secondary containment	X		Required only if it is determined prior to certification of final closure that the unit must be closed as a landfill.
Tank without secondary containment	X*	X*	X
Incinerator	X		
Landfill	X		X
Land treatment	X		X
Disposal surface impoundment	X		X
Storage or treatment surface impoundment: satisfies liner design standards	X		Required only if it is determined prior to the certification of closure that the unit must be closed as a landfill.
Storage or treatment surface impoundment: does not satisfy liner design standards		X	X
Waste pile: satisfies liner design standards	X		Required only if it is determined prior to the certification of closure that the unit must be closed as a landfill.
Waste pile: does not satisfy liner design standards		X	X
<u>Interim Status facilities</u>			
Container	X		
Tank with secondary containment	X		Required only if it is determined prior to certification of final closure that the unit must be closed as a landfill.
Tank without secondary containment	X*	X*	X
Incinerator	X		
Landfill	X		X
Land treatment	X		X
Disposal surface impoundment	X		X
Storage or treatment surface impoundment	X		Required only if it is determined prior to the certification of closure that the unit must be closed as a landfill.
Waste pile	X		Required only if it is determined prior to the certification of closure that the unit must be closed as a landfill.

* These units require one cost estimate based on the most expensive method of closure.

- (2) Owners or operators of ALL facilities with disposal units must prepare estimates of the costs of conducting 30 years of post-closure care based on the post-closure plan. Disposal units include landfills, land treatment, and disposal surface impoundments.
- (3) ALL owners or operators of surface impoundments, waste piles, and tanks required to prepare contingent closure and post-closure plans must prepare closure and post-closure cost estimates consistent with the contingent plans.³ Owners or operators of tanks must prepare a closure cost estimate consistent with the contingent closure plan if those costs are higher than the costs of "clean closure".⁴ (See Section 2.1.3 of this manual for further discussion on contingent plans.)
- (4) Owners or operators of ALL storage or treatment surface impoundments, waste piles, or tanks not otherwise required to prepare contingent plans and cost estimates must revise the closure cost estimate and prepare a post-closure cost estimate if it is determined prior to the certification of final closure that the unit must be closed as a landfill.⁵

4.2 BASIC RULES FOR PREPARING COST ESTIMATES

The following sections describe the assumptions that should be used when preparing closure and post-closure cost estimates:

- Section 4.2.1 -- Relationship between the closure and post-closure plans and cost estimates;
- Section 4.2.2 -- Scope of the closure cost estimate;
- Section 4.2.3 -- Scope of the post-closure cost estimate;
- Section 4.2.4 -- Inclusion of ground-water monitoring costs in cost estimates;

³ 40 CFR 264.228(c) and 264.258(c).

⁴ 40 CFR 264.197(c) and 265.197(c).

⁵ 40 CFR 264.112(c), 264.118(a) and (c), 264.197(b), 265.112(c), 265.118(a) and (d), and 265.197(b).

- Section 4.2.5 -- First- vs. third-party costs; and
- Section 4.2.6 -- Disallowance of salvage value and zero credit for sale of hazardous wastes.

4.2.1 Relationship Between the Closure and Post-Closure Plans and Cost Estimates

The closure and post-closure cost estimates must be based on activities described in the closure and post-closure plans (or contingent plans). Exhibit 4-2 lists the key activities that must be included in the closure and post-closure cost estimates. Closure and post-closure cost estimates must include a cost for each activity or sub-activity outlined in the closure and post-closure plans. The cost components included in the cost estimate should correspond to the activities described in the plan.

The cost estimates may be prepared on a per-unit basis or for the whole facility. Appendix C of this manual includes sample closure and post-closure plan checklists prepared on a per-unit basis that may be useful in identifying cost components to include in the cost estimates. The Cost Estimate Guidance Manual also presents costs on a per-unit basis. Owners or operators of facilities with multiple units may prefer to estimate certain costs (e.g., final cover installation, incineration of inventory, removal of wastes from an impoundment) on a per-unit basis and others on a facility-wide basis (e.g., ground-water monitoring, testing for soil contamination, removal of contaminated soil and residues, decontamination of facility equipment and structures, and certification of final closure).

4.2.2 Scope of the Closure Cost Estimate

The closure cost estimate should reflect the costs of conducting closure in the year that the estimate is prepared. Annually thereafter, the owner or operator must update this estimate for inflation either by using an inflation adjustment factor, or by recalculating the cost estimate based on current costs of that year (see Section 4.4).

The closure cost estimate must be based on the most expensive cost of closure at any time over the life of the facility.⁶ The closure cost estimate should always be high enough to ensure that if, at any time, the facility had to begin closure, the costs of closure would not exceed the cost estimate. For example, the cost estimate must account for the costs of managing the maximum inventory over the life of the facility, including the costs of constructing a new cell to handle the wastes, if necessary, if the wastes are to be disposed on-site, and closing the maximum number of cells of a landfill even open, including those no longer receiving wastes but not yet completely closed. The conditions on which the cost estimate is predicated may differ significantly from the conditions anticipated at the end of normal facility life.

⁶ 40 CFR 264.142(a)(1) and 265.142(a)(1).

EXHIBIT 4-2

KEY ACTIVITIES TO BE INCLUDED IN THE CLOSURE
AND POST-CLOSURE COST ESTIMATES

ACTIVITIES	
CLOSURE	POST-CLOSURE CARE
Inventory management <ul style="list-style-type: none">- transportation to off-site TSDF- on-site treatment or disposal	Monitoring
Facility decontamination	Leachate management
Monitoring activities	Routine maintenance
Final cover installation	Filing post-closure notices
Maintenance of security	Maintenance of security
Survey plat	Post-closure certification
Closure certification	

In some cases, owners or operators may intend to expand the capacity or capabilities of the facilities by constructing new hazardous waste management units or expanding existing ones. The cost estimate must equal the maximum costs of closing all units currently active at the facility. If an owner or operator does not close units prior to expanding or constructing new ones, the maximum extent of operation over the life of the facility will be significantly greater than at the time the cost estimate was first prepared and subsequently updated. Owners and operators must revise their cost estimates whenever the cost of closing the units currently active at the facility increases. When new units are constructed or existing units are expanded, the cost estimate must be increased within 60 days prior to the initial receipt of hazardous waste at the new (or expanded) unit.

The cost estimate need not include the costs of responding to highly unusual contingencies unless such circumstances apply at the time the owner or operator prepares the initial cost estimate. For example, the cost estimate need not account for costs resulting from the effects of the 100-year flood or a liner failure that requires all hazardous wastes in a trench to be dug up and disposed elsewhere. If such an event occurs during the life of the unit or facility, thus causing the original maximum inventory estimate to be exceeded, the owner or operator should revise the closure plan and cost estimate to account for the new conditions, unless the maximum inventory will be reduced to the level originally estimated quickly.

To account for the maximum costs of closure, the cost estimate should reflect fully loaded costs, including cost of labor, fuel and maintenance, contingency fees which are routinely incorporated into contractor cost estimates. Finally, the closure cost estimates must be based on the costs of hiring an independent party to conduct closure (see Section 4.2.5).

4.2.3 Scope of the Post-Closure Cost Estimate

The post-closure cost estimate must reflect the costs of monitoring and maintaining each disposal unit of the facility for the entire post-closure care period.⁷ When preparing the cost estimate, the owner or operator should assume a 30-year post-closure care period unless the Regional Administrator or State Director extends or reduces the length of the period prior to final closure of the facility. Because the timing of the post-closure care period may vary by unit (i.e., some units will be closed while others will be operating) at some facilities it may be easiest to calculate post-closure care costs on a per-unit basis.

The post-closure cost estimate for each unit is calculated by multiplying the current ANNUAL post-closure cost estimate by the number of years of

⁷ 40 CFR 264.144(a) and 265.144(a).

post-closure care required.⁸ The estimate must include the cost of activities conducted annually over the post-closure care period (e.g., ground-water monitoring and inspections), and activities required less frequently, such as: extensive soil replacement and maintenance or replacement of equipment (e.g., ground-water monitoring wells).

The post-closure cost estimate should reflect the costs of 30 years of post-closure care in the year that the estimate is prepared and should be adjusted annually thereafter until final closure has been certified (see Section 4.4). The post-closure cost estimate should also incorporate fully loaded costs and third-party costs (see Section 4.2.5).

4.2.4 Inclusion of Ground-Water Monitoring Costs in Cost Estimates

The cost estimate for ground-water monitoring during the closure and post-closure care periods, should be consistent with the costs of monitoring activities conducted during the operating life. If a corrective action program has been instituted at a unit or facility, the costs of conducting corrective action do not need to be included in the cost estimates.⁹ The costs of compliance monitoring, however, must be included.

4.2.5 First- vs. Third-Party Costs

The regulations specify that the closure and post-closure cost estimates must be based on the costs to the owner or operator of hiring a THIRD PARTY to conduct the activities specified in the closure and post-closure plans.¹⁰ Parents or subsidiaries of the owner or operator cannot be considered third parties.¹¹ The regulations do not require that the estimates be prepared by a third party.

⁸ 40 CFR 264.144(a)(2) and 265.144(a)(2).

⁹ Regulations requiring financial assurance for corrective action are currently being developed under the authority of RCRA Sections 3004(a) and (u). Financial assurance for corrective action was proposed on October 24, 1986 in 51 Federal Register 37854.

¹⁰ 40 CFR 264.142(a)(2), 264.144(a)(1), 265.142(a)(2), and 265.144(a)(1).

¹¹ 40 CFR 264.142(a)(2), 264.144(a)(1), 265.142(a)(2), and 265.144(a)(1). A parent is a corporation that directly owns 50 percent or more of the voting stock of the corporation that owns or operates the facility. A corporation is considered a subsidiary of the owner or operator if 50 percent or more of its stock is owned by the owner or operator (40 CFR 264.141(d) and 265.141(d)).

The following assumptions should be used when preparing the estimates:

- Hazardous wastes may be treated or disposed of on site or at an off-site TSDF. However, if an owner or operator chooses on-site management, he must demonstrate that on-site capabilities will be available at all times over the life of the facility. For example, if an owner or operator intends to dispose of wastes in tanks by deep welling them on site, the plan must indicate that the underground injection wells will be open and operating and are allowed to accept the wastes from the tank. In addition, if the owner or operator intends to dispose of wastes on site, he must demonstrate that disposal capacity will be available at all times over the life of the facility. (If the owner or operator intends to dig a trench or cell at closure to handle remaining inventory, the costs of cell design and construction must be included in the cost estimate.)
- The estimate of costs of managing hazardous wastes on site must be sufficient to cover routine maintenance that may be required at any time over the life of the facility (e.g., operating and maintenance costs for incinerators).
- The cost estimates must incorporate the costs of a third party conducting all closure and post-closure care activities including managing hazardous wastes on site, if applicable. For example, the estimate must include the costs of hiring a third party to pretreat wastes and dispose of them on site.

Although the estimates must be based on the costs of a third party conducting all closure and post-closure care activities, the owner or operator or a corporate parent or subsidiary may conduct the activities specified in the closure and post-closure plans. Under all circumstances, however, closure and post-closure care certifications must be completed by an INDEPENDENT registered professional engineer.¹²

4.2.6 Disallowance of Salvage Value and Zero Credit for Sale of Hazardous Wastes

An owner or operator may intend to recycle all remaining hazardous wastes or sell equipment, land, or hazardous waste. While these practices are encouraged, an owner or operator may not deduct the potential salvage value of these items from the closure cost estimate.¹³ Similarly, owners or operators may not assign a zero value to the costs of disposing of wastes that are expected to have economic value at closure.¹⁴

¹² 40 CFR 264.115, 264.120, 265.115 and 265.120.

¹³ 40 CFR 264.142(a)(3) and 265.142(a)(3).

¹⁴ 40 CFR 264.142(a)(4) and 265.142(a)(4).

4.3 REVISING COST ESTIMATES TO REFLECT CHANGES IN CLOSURE AND POST-CLOSURE PLANS

Prior to certification of final closure of the facility, owners or operators must revise the closure and post-closure cost estimate whenever a change in the closure or post-closure plan **INCREASES** the cost estimate.¹⁵ (See Section 3.3 of this manual for a discussion of deadlines and procedures for revising the plans and estimates.) If the Regional or State Office determines prior to final closure that post-closure care for any or all of the units must continue for longer than 30 years, the owner or operator must increase the post-closure cost estimate accordingly. If an owner or operator of a storage or treatment impoundment, waste pile, or tank system not otherwise required to prepare a post-closure cost estimate must close the unit as a landfill, the owner or operator must prepare a post-closure cost estimate. An owner or operator may revise the cost estimates if a change in the plans results in a decrease in the costs.

4.3.1 Changes in the Closure or Post-Closure Plans that May Increase the Cost Estimates

The following changes in facility conditions or activities could increase the closure or post-closure cost estimate:

- An increase in facility size and/or capacity;
- Changes in the partial closure schedule (e.g., an owner or operator conducts partial closures of the facility less frequently than originally scheduled, thus increasing the maximum extent of the operation);
- An increase in the estimate of maximum inventory;
- Changes in the types of hazardous wastes to be handled at closure;
- Changes in regulatory requirements that affect the costs of closure activities (e.g., pretreatment standards that must be satisfied to landfill certain hazardous wastes;

¹⁵ 40 CFR 264.142(c), 264.144(c), 265.142(c), and 265.144(c).

- More extensive ground-water monitoring requirements as a result of an owner's or operator's operating experience or the availability of new data that were previously unavailable;
- Contingencies over the operating life of the facility which affect the types of activities that will be required at closure or during the post-closure care period;
- For surface impoundments, wastes piles, and tanks not otherwise subject to the contingent plan and cost estimate requirements, extensive soil contamination results in the need to close the unit as a landfill and conduct post-closure care;
- Extensions to the length of the post-closure care period for one or more units;
- Changes in annual or intermittent post-closure care maintenance activities, including changes in the nature and frequency of the activities required; and
- Changes in surrounding land use (e.g., an increase in population density surrounding the facility warrants increased security provisions during the post-closure care period; expanded ground-water monitoring is required due to a change in the underlying ground-water usage).

4.3.2 Changes in the Closure or Post-Closure Plans that May Decrease the Cost Estimates

The closure cost estimate may be reduced **ONLY** if the new estimate still accounts for the maximum costs of closing operating units at any time over the life of the facility. The following changes in facility conditions may justify a decrease in the closure or post-closure cost estimate:

- Reductions in the size of the facility remaining to be closed over the remaining life of the facility (e.g., if the maximum cost of closure over the life of the facility includes the costs of closing two landfill cells and four tanks, the cost estimate may be reduced after closure of the entire landfill if only the storage tanks were operating for the remaining life of the facility);
- Reduction in the size of the facility subject to post-closure care (e.g., fewer cells of a landfill are operated than were originally intended);

- Changes in manufacturing processes reduce the quantities of hazardous wastes to be handled at closure;
- Reduction in the number of years of post-closure care remaining for units closed prior to final closure of the facility.

4.4 ANNUAL ADJUSTMENTS FOR INFLATION

The closure and post-closure cost estimates must equal the current costs of closing the facility and conducting 30 years of post-closure care. To account for annual inflation, an owner or operator may either: (1) recalculate estimates every year using that year's current prices; or (2) every year multiply the current estimate by an inflation factor that measures the general trend in prices in the economy.¹⁶ The cost estimates must be updated until final closure of the facility.

4.4.1 Options for Updating the Closure and Post-Closure Cost Estimates for Inflation

Owners or operators may choose to update their cost estimates for inflation by recalculating the costs using current dollars. For example, if the owner or operator prepared the initial cost estimates in 1985 using the prevailing prices in 1985, in 1986 he may recalculate the estimates using the prices prevailing in 1986.

If the owner or operator chooses to update the cost estimates annually using an inflation factor, this factor must be derived from the most recent Annual Implicit Price Deflator for Gross National Product (GNP) and the Annual Implicit Price Deflator of the previous year.¹⁷ The implicit price deflator is an index that reflects the increase or decrease in the general price level over the past year, using prices from the year 1982 as the base.

Owners or operators using the implicit price deflator to adjust their cost estimates for inflation should follow these three steps:

- Step 1. Obtain the most recent annual Implicit Price Deflator and the annual Implicit Price Deflator of the previous year.
- Step 2. Calculate the inflation factor.
- Step 3. Multiply the inflation factor by the cost estimate to derive the new cost estimate.

¹⁶ 40 CFR 264.142(b), 264.144(b), 265.142(b), and 265.144(b).

¹⁷ 40 CFR 264.142(b), 264.144(b), 265.142(b), and 265.144(b).

STEP 1. Obtain the MOST RECENT Annual Implicit Price Deflator and the Annual Deflator for the previous year from the following sources:¹⁸

- (1) The Survey of Current Business;
- (2) Economic Indicators;
- (3) Regional or State EPA Office; and
- (4) RCRA/Superfund Hotline.

(1) The Survey of Current Business, is published monthly by the U.S. Department of Commerce, Bureau of Economic Analysis. The figures for the Annual Implicit Price Deflators are included in the section of the Survey of Current Business called "National Income and Product Accounts Tables." The deflators are generally found in Table 7.1, entitled "Implicit Price Deflators for Gross National Product." Exhibit 4-3 includes a sample page from the November 1985 issue. The Implicit Price Deflator that is used to adjust the cost estimate is the one specified for Gross National Product (GNP) -- line 1 in Table 7.1 (see line 1 on Exhibit 4-3). The most recent annual deflator and the annual deflator of the previous year must be used. Therefore, the owner or operator should refer only to the annual totals for GNP and ignore all quarterly data. The most recent annual deflator in this issue is for 1984 -- 223.43; the deflator for the previous year (1983) is 215.34. (See "A" on Exhibit 4-3.)

Subscriptions of Survey of Current Business may be obtained for \$30.00 per year by contacting the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402. It also should be available in most large public libraries. If the publication is not available in the owner's or operator's library, the owner or operator may wish to urge the library to obtain the document from a Federal Depository Library. The Federal Depository Library Program provides government publications free of charge to designated libraries. Because of lag times in publishing and distribution, if the current month's issue is not available, the owner or operator should use the annual price deflators from the most recent issue available.

¹⁸ Because the Department of Commerce derives the Annual Implicit Price Deflator by averaging prices throughout the calendar year, the Annual Implicit Price Deflator is generally not available until February of the following calendar year. Therefore, the most recent Annual Implicit Price Deflator will reflect inflation of the previous calendar year. For example, cost estimates adjusted for inflation in April 1987 will be updated using the Annual Implicit Price Deflator for 1986.

EXHIBIT 4-3

SURVEY OF CURRENT BUSINESS

November 1985

Table 3.2.—Federal Government Receipts and Expenditures

	Billions of dollars						
	1983	1984	Seasonally adjusted at annual rates				1985
			1984	1984	1984	1985	
			II	III	IV	I	II
							III
Receipts.....	641.1	704.7	704.3	706.2	721.9	771.4	733.9
Personal tax and nontax receipts.....	295.2	315.0	310.7	319.7	327.9	362.2	318.3
Income taxes.....	288.8	308.4	303.8	314.0	321.2	355.4	310.8
Estate and gift taxes.....	5.9	5.9	6.2	5.0	6.0	6.2	6.7
Nontaxes.....	5	7	6	7	7	7	7
Corporate profits tax accruals.....	39.8	70.9	75.6	65.3	69.1	67.4	66.1
Indirect business tax and nontax accruals.....	32.4	55.5	55.9	56.1	55.9	56.4	60.7
Excise taxes.....	36.1	35.8	36.1	35.6	35.5	35.3	35.3
Customs duties.....	9.1	11.9	12.1	12.4	12.1	12.5	11.5
Nontaxes.....	7.1	7.3	7.7	9.2	8.4	8.7	13.8
Contributions for social insurance.....	233.7	263.4	262.0	266.2	269.0	285.3	288.9
Expenditures.....	819.7	886.5	868.0	866.8	919.7	936.5	948.0
Purchases of goods and services.....	269.7	295.4	296.4	302.0	315.7	319.9	324.2
National defense.....	200.5	221.5	220.3	220.3	231.6	223.9	241.1
Nondefense.....	69.3	73.9	75.6	81.7	84.1	85.9	83.2
Transfer payments.....	345.6	353.0	350.1	353.9	360.4	370.3	369.8
To persons.....	338.7	344.5	343.7	346.2	347.2	363.1	361.6
To foreigners.....	7.0	8.4	6.4	7.7	13.1	7.2	8.2
Grants-in-aid to State and local governments.....	86.3	93.2	93.2	92.1	97.0	95.1	98.1
Net interest paid.....	94.2	116.7	110.9	122.0	126.4	128.2	132.2
Interest paid.....	119.5	143.6	138.0	149.0	153.9	155.6	159.6
To persons and businesses.....	101.8	124.0	119.2	128.9	132.9	134.9	139.0
To foreigners.....	17.7	19.6	18.9	20.0	21.0	20.7	20.6
Less: Interest received.....	25.3	26.9	27.2	27.0	27.4	27.4	26.9
Subsidies less current surplus of government enterprises.....	23.4	22.3	17.7	16.5	20.7	23.1	22.1
Subsidies.....	21.7	21.6	16.4	15.8	20.5	23.7	25.7
Less: Current surplus of government enterprises.....	-1.7	-7	-1.3	-7	-3	6	3.6
Less: Wage accruals less disbursements.....	-4	1	2	-4	5	1	-1.0
Surplus or deficit (-), NIPA's.....	-178.6	-175.8	-163.7	-166.6	-197.8	-165.1	-214.1
Social insurance funds.....	-28.4	-8.5	-7.7	-7.3	-10.2	-2.5	1.8
Other.....	-150.2	-167.4	-156.0	-173.3	-187.7	-162.6	-215.8

Table 3.3.—State and Local Government Receipts and Expenditures

	1983	1984	1984	1984	1984	1984	1984
Receipts.....	478.2	523.6	520.6	524.6	539.7	546.6	558.0
Personal tax and nontax receipts.....	109.0	120.3	119.6	121.2	123.8	126.8	129.9
Income taxes.....	58.7	64.5	64.5	64.5	65.7	67.2	68.7
Nontaxes.....	40.8	45.8	45.2	46.5	47.8	49.1	50.6
Other.....	9.5	10.0	9.9	10.2	10.3	10.5	10.7
Corporate profits tax accruals.....	16.0	19.1	20.2	17.8	18.5	17.9	17.8
Indirect business tax and nontax accruals.....	228.0	248.4	245.4	250.5	256.6	261.1	266.8
Sales taxes.....	107.4	119.4	118.3	120.2	123.0	125.0	127.9
Property taxes.....	91.3	96.3	96.9	99.4	101.9	103.9	106.0
Other.....	29.3	30.7	30.2	30.9	31.7	32.2	32.9
Contributions for social insurance.....	39.0	42.6	42.1	43.0	43.8	44.7	45.7
Federal grants-in-aid.....	86.3	93.2	93.2	92.1	97.0	95.1	98.1
Expenditures.....	434.1	478.7	466.1	477.0	484.0	491.9	507.7
Purchases of goods and services.....	415.8	452.0	447.4	458.9	464.8	472.0	486.7
Compensation of employees.....	241.4	260.7	258.3	263.0	267.8	273.3	283.3
Other.....	174.4	191.3	189.1	195.9	197.0	198.7	208.3
Transfer payments to persons.....	50.7	54.8	54.4	54.8	56.6	57.6	58.9
Net interest paid.....	-21.9	-25.3	-24.9	-25.9	-26.4	-26.4	-26.4
Interest paid.....	32.4	38.2	37.5	39.0	40.6	42.2	43.8
Less: Interest received.....	54.3	63.5	62.4	64.9	66.9	68.6	70.2
Less: Dividends received.....	2.6	2.8	2.7	2.8	2.9	3.0	3.1
Subsidies less current surplus of government enterprises.....	-7.8	-8.1	-8.0	-8.1	-8.2	-8.2	-8.3
Subsidies.....	3	6	6	6	6	7	7
Less: Current surplus of government enterprises.....	8.3	8.7	8.6	8.7	8.8	8.9	9.0
Less: Wage accruals less disbursements.....	0	0	0	0	0	0	0
Surplus or deficit (-), NIPA's.....	44.1	52.9	54.5	47.6	55.6	53.7	50.3
Social insurance funds.....	37.5	42.6	41.9	43.3	44.5	45.4	46.6
Other.....	6.6	10.4	12.6	4.3	11.1	3.3	4.2

Table 7.1.—Implicit Price Deflators for Gross National Product

Line one	Index numbers, 1972=100						
	1983	1984	Seasonally adjusted				1985
			1984	1984	1984	1985	
			II	III	IV	I	II
							III
Gross national product.....	215.34	223.43	222.40	224.57	226.10	229.07	230.55
Personal consumption expenditures.....	213.6	220.4	219.2	221.5	222.8	224.6	226.2
Durable goods.....	177.7	179.0	179.5	179.2	178.4	179.1	178.1
Nondurable goods.....	213.0	217.7	216.4	217.8	219.4	220.1	221.2
Services.....	226.0	237.6	238.0	239.7	242.0	245.2	248.1
Gross private domestic investment.....	216.0	218.7	218.6	219.2	220.1	222.1	222.4
Fixed investment.....	206.4	207.8	207.4	208.0	209.4	211.9	214.8
Nonresidential.....	263.7	264.5	264.1	265.2	265.9	268.1	271.0
Structures.....	183.3	186.0	185.4	186.5	187.6	189.2	191.3
Producers' durable equipment.....	246.4	255.7	255.9	258.6	259.1	258.6	259.3
Residential.....	249.4	259.0	259.2	262.1	262.7	262.2	262.9
Nonfarm structures.....	247.3	261.5	261.7	261.1	266.5	271.8	274.2
Farm structures.....	172.6	173.2	173.6	172.3	172.9	172.6	171.5
Change in business inventories.....							
Net exports of goods and services.....							
Exports.....	241.0	249.4	250.4	250.1	249.6	251.0	252.0
Imports.....	271.5	266.0	269.6	263.3	263.7	252.8	257.1
Government purchases of goods and services.....	234.9	247.4	244.2	248.6	251.4	254.6	258.6
Federal.....	232.1	241.2	240.6	241.5	243.7	245.4	250.1
National defense.....	236.6	247.2	246.4	247.4	249.6	252.4	255.6
Nondefense.....	220.0	224.7	225.1	227.1	228.2	231.5	235.2
State and local.....	236.7	251.7	250.0	253.5	256.9	260.9	264.7

Table 7.2.—Fixed-Weighted Price Indexes for Gross National Product, 1972 Weights

	Index numbers, 1972=100						
	1983	1984	Seasonally adjusted				1985
			1984	1984	1984	1985	
			II	III	IV	I	II
							III
Gross national product.....	223.8	233.4	232.8	235.1	237.2	239.7	242.1
Personal consumption expenditures.....	222.4	231.1	230.0	232.2	234.5	236.4	238.6
Durable goods.....	185.0	188.9	188.8	189.1	189.8	191.1	191.2
Nondurable goods.....	223.2	229.7	229.8	229.6	231.7	232.4	234.8
Services.....	234.3	246.9	245.2	249.4	252.3	255.5	258.9
Gross private domestic investment.....	224.5	240.6	242.2	244.0	244.9	245.6	247.0
Fixed investment.....	230.4	234.9	234.7	236.1	237.1	238.7	240.4
Nonresidential.....	248.8	255.4	255.3	256.2	257.6	259.9	262.6
Structures.....	219.3	223.0	222.8	224.5	225.4	226.5	227.7
Producers' durable equipment.....	242.3	251.7	256.4	259.0	259.7	258.7	259.6
Residential.....							
Change in business inventories.....							
Net exports of goods and services.....							
Exports.....	248.0	254.8	257.2	258.3	255.3	255.4	255.8
Imports.....	299.9	299.0	302.1	299.3	297.0	292.2	291.7
Government purchases of goods and services.....	236.5	249.2	248.2	250.6	252.9	257.2	259.9
Federal.....	236.7	246.5	246.4	247.3	247.9	252.3	253.5
National defense.....	242.3	252.6	252.9	253.4	253.8	258.5	259.8
Nondefense.....	220.7	220.0	221.6	221.7	222.2	223.2	229.2
State and local.....	236.4	251.0	249.4	252.8	256.2	260.1	264.1
Addenda:							
Gross domestic purchases ¹	227.2	236.3	235.7	237.9	239.9	242.1	244.4
Final sales.....	229.8	233.5	232.9	235.2	237.3	239.9	242.3
Final sales to domestic purchasers ¹	227.3	236.4	235.8	238.0	240.1	242.3	244.6
Personal consumption expenditures, food.....	221.8	230.9	229.5	230.9	232.7	234.2	233.9
Personal consumption expenditures, energy.....	365.0	368.3	369.1	367.9	369.4	365.2	376.0
Other personal consumption expenditures.....	209.4	218.5	217.3	220.1	222.5	225.1	227.5
Gross domestic product.....	224.3	233.9	233.0	235.3	237.4	240.0	242.4
Business.....	223.5	232.4	231.6	233.9	236.0	238.1	240.3
Nonfarm.....	224.6						

Table 7.1-7.2.

¹ Gross domestic purchases equals GNP less exports plus imports; final sales to domestic purchasers equals final sales less exports plus imports.

ICF INCORPORATED

(2) Economic Indicators is published monthly by the Council of Economic Advisors. The same GNP annual deflators as are published in the Survey of Current Business are published on page 2 of Economic Indicators in a table entitled "Implicit Price Deflators for Gross National Product." Exhibit 4-4 includes a sample page from the November 1985 issue. As discussed above, the owner or operator should refer to the most recent annual figure for GNP and the annual figure for the previous year. (See "B" on Exhibit 4-4.)

Subscriptions may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, for \$27.00 per year. It also should be available in most large public libraries or through the Federal Depository Library Program.

(3) The EPA Regional or State Office should maintain a subscription to Survey of Current Business or Economic Indicators.

(4) The owner or operator may also contact the RCRA/Superfund Hotline toll free from 8:30 to 4:30 EST at 800-424-9346. In Washington, D.C., the number is 202-382-3000. The owner or operator should be sure to request the most recent Annual Implicit Price Deflator and the final Annual Implicit Price Deflator for the previous year.

STEP 2. Calculate the inflation factor by dividing the most recent annual implicit price deflator by the annual implicit price deflator of the previous year. Using the figures included in the November 1985 issue of Survey of Current Business or Economic Indicators (shown in Exhibits 4-3 and 4-4) as an example, the inflation factor would be calculated as follows:

$$\begin{array}{r} \text{Most recent GNP Annual Implicit Price Deflator, 1984} \quad (223.43) \\ \hline \text{Previous Year's Annual GNP Implicit Price Deflator, 1983} \quad (215.34) \\ \hline \end{array} =$$

The result is an inflation factor of 1.04.

STEP 3. Adjust the cost estimates for inflation by multiplying the most recent closure and post-closure cost estimates by the inflation factor. For example, if a closure cost estimate of \$100,000 prepared in December 1984 were adjusted for inflation in December 1985, the new cost estimate would be \$104,000 (i.e., \$100,000 times the inflation factor of 1.04). Each subsequent update for inflation will adjust the cost estimates updated the previous year. Using the above example, in December 1986, the owner or operator will multiply the new cost estimate of \$104,000 by an inflation factor derived from the 1985 and 1984 Deflators.

4.4.2 Deadlines for Adjusting Cost Estimates for Inflation

Owners and operators must update their closure and post-closure cost estimates within 60 days PRIOR to the anniversary date of the establishment of the financial assurance instrument. Owners or operators who use the financial test to demonstrate financial assurance must update their cost

EXHIBIT 4-4

GROSS NATIONAL PRODUCT IN 1972 DOLLARS

(Billions of 1972 dollars; quarterly data at seasonally adjusted annual rates)

Period	Gross national product	Personal consumption expenditures	Gross private domestic investment			Exports of goods and services			Government purchases of goods and services					Final sales
			Nonresidential fixed	Residential fixed	Change in business inventories	Net exports	Exports	Imports	Total	Federal			State and local	
										Total	National defense	Non-defense		
1976.....	1,298.2	823.1	125.6	51.2	7.8	25.4	110.1	84.7	265.2	96.8	64.9	31.8	168.4	1,290.4
1977.....	1,369.7	864.3	140.3	60.7	13.3	22.0	112.9	90.9	269.2	100.4	65.4	35.0	168.8	1,356.4
1978.....	1,438.6	903.2	158.3	62.4	16.0	24.0	126.7	102.7	274.6	100.3	65.7	34.7	174.3	1,422.6
1979.....	1,479.4	927.6	169.9	59.1	7.3	37.2	146.2	109.0	278.3	102.1	67.4	34.8	176.2	1,472.2
1980.....	1,475.0	931.8	165.8	47.1	-4.4	30.3	159.1	108.8	284.3	106.4	70.0	36.4	177.9	1,479.4
1981.....	1,512.2	950.5	175.0	44.5	11.3	43.8	160.2	116.4	287.0	110.3	73.5	36.7	176.8	1,500.9
1982.....	1,480.0	963.3	166.9	37.9	-10.4	29.7	147.6	118.0	292.7	117.0	79.1	37.9	175.7	1,490.4
1983.....	1,534.7	1,009.2	171.0	53.7	-3.8	12.6	139.5	126.9	291.9	116.2	84.7	51.5	175.7	1,538.3
1984.....	1,639.3	1,062.4	204.9	60.2	24.8	-15.0	146.0	161.1	302.1	122.5	89.6	32.9	179.6	1,614.5
1982: III.....	1,477.1	964.2	163.9	36.8	-6.4	25.7	146.6	120.9	292.8	117.2	80.6	36.6	175.7	1,483.5
1982: IV.....	1,478.8	976.3	161.5	40.8	-24.6	24.1	136.7	112.6	300.6	124.8	81.9	42.9	175.8	1,503.4
1983: I.....	1,491.0	982.5	161.6	46.2	-16.5	22.9	138.2	115.3	294.3	119.0	83.3	35.7	175.3	1,507.5
1983: II.....	1,524.8	1,006.2	165.3	53.4	-6.1	13.6	137.0	123.4	292.4	117.2	84.8	32.3	175.2	1,530.9
1983: III.....	1,550.2	1,015.6	172.6	57.2	.9	11.9	141.6	129.7	292.0	115.6	84.4	31.2	176.4	1,549.3
1983: IV.....	1,572.7	1,032.4	184.5	57.8	7.2	3.0	141.0	139.1	288.8	113.0	86.3	26.7	175.8	1,565.4
1984: I.....	1,610.9	1,044.1	193.3	60.6	31.6	-8.3	144.9	153.2	289.5	112.2	87.1	25.2	177.3	1,579.3
1984: II.....	1,638.8	1,064.2	202.9	60.8	20.3	-11.4	144.7	156.2	302.1	123.2	89.6	33.6	178.9	1,618.5
1984: III.....	1,645.2	1,065.9	209.5	60.1	30.6	-27.0	147.4	174.4	306.1	125.0	89.1	36.0	181.1	1,614.6
1984: IV.....	1,662.4	1,075.4	213.8	59.2	16.8	-13.4	147.1	160.5	310.5	129.6	92.7	36.8	180.9	1,645.6
1985: I.....	1,663.5	1,089.1	213.0	60.0	19.1	-25.4	143.7	172.1	310.7	129.8	92.7	37.1	180.9	1,644.4
1985: II.....	1,671.3	1,102.1	220.3	60.9	8.3	-33.8	137.9	171.8	313.5	129.7	94.3	35.4	183.9	1,663.0
1985: III.....	1,688.9	1,116.5	218.2	62.6	2.5	-38.4	138.0	176.4	327.5	141.3	99.9	41.4	186.2	1,686.4

Source: Department of Commerce, Bureau of Economic Analysis.

IMPLICIT PRICE DEFLATORS FOR GROSS NATIONAL PRODUCT

Column
one

(1972 = 100; quarterly data are seasonally adjusted)

Period	Gross national product	Personal consumption expenditures				Gross private domestic investment		Exports and imports of goods and services		Government purchases of goods and services			
		Total	Durable goods	Nondurable goods	Services	Nonresidential fixed	Residential fixed	Exports	Imports	Federal			State and local
										Total	National defense	Non-defense	
1976.....	132.34	131.7	123.9	137.2	129.6	138.6	140.7	155.3	185.6	133.5	132.4	135.7	138.3
1977.....	140.05	139.3	129.2	143.6	139.3	146.3	158.0	161.9	205.5	142.8	141.9	144.6	148.4
1978.....	150.42	149.1	136.4	153.4	150.0	157.2	178.3	172.6	214.1	153.1	152.7	153.8	159.7
1979.....	163.42	162.5	145.0	169.9	162.3	170.8	200.5	192.5	246.1	164.8	166.0	162.5	173.7
1980.....	178.42	179.0	156.2	188.1	178.8	186.2	218.5	212.9	299.4	185.2	187.5	180.8	191.5
1981.....	195.60	194.5	167.1	202.5	196.8	202.2	234.1	230.9	293.8	207.6	209.1	204.7	208.0
1982.....	207.38	206.0	174.5	208.7	213.6	209.5	241.3	236.0	279.3	221.4	227.0	209.8	222.8
1983.....	215.34	213.6	177.7	213.0	226.0	206.4	246.4	241.0	271.5	232.1	236.6	220.0	236.7
1984.....	223.43	220.4	179.0	217.7	237.6	207.8	255.7	249.4	266.0	241.2	247.2	224.7	251.7
1982: III.....	208.53	207.6	173.5	209.6	215.8	208.8	241.8	236.2	280.9	223.2	227.4	213.9	224.7
1982: IV.....	210.27	209.6	175.6	210.5	219.4	210.1	240.0	235.3	280.1	223.8	233.1	206.2	229.4
1983: I.....	212.87	210.7	176.6	210.2	221.9	207.1	245.2	237.7	267.8	229.4	233.7	219.4	231.5
1983: II.....	214.25	212.8	176.8	212.6	224.9	205.2	243.0	239.4	271.0	230.8	234.8	220.3	234.9
1983: III.....	215.89	214.8	178.0	214.5	227.3	205.1	248.7	241.5	276.3	232.8	237.9	219.1	238.4
1983: IV.....	218.21	216.0	179.3	214.8	229.7	208.1	248.3	245.4	270.3	235.6	240.0	221.4	241.3
1984: I.....	220.58	218.0	179.0	217.4	232.6	206.3	249.4	247.7	267.9	238.5	245.1	215.5	246.4
1984: II.....	222.40	219.2	179.5	216.4	236.0	207.4	253.9	250.4	269.6	240.6	246.4	225.1	250.0
1984: III.....	224.57	221.5	179.2	217.8	239.7	208.0	258.6	250.1	263.3	241.5	247.4	227.1	253.5
1984: IV.....	226.10	222.8	178.4	219.4	242.0	209.4	259.1	249.6	263.7	243.7	249.8	228.2	256.9
1985: I.....	229.07	224.8	179.1	220.1	245.2	211.8	258.6	251.0	252.8	246.4	252.4	231.5	260.9
1985: II.....	230.55	226.2	178.4	221.2	248.1	212.1	259.3	252.0	257.1	250.1	255.6	235.2	264.7
1985: III.....	231.86	227.4	178.1	221.7	251.2	214.8	260.5	251.4	255.6	248.2	255.4	230.9	267.9

Source: Department of Commerce, Bureau of Economic Analysis.

estimates for inflation within 30 days AFTER the end of the firm's fiscal year and prior to the submission of financial test documentation to the Regional or State Office.

Prior to October 29, 1986 (the effective date of the May 2, 1986 rules), cost estimates were updated for inflation on the anniversary date of the cost estimate rather than on the anniversary date of the financial assurance mechanism. This change in deadlines may result in a number of one-time adjustment rules that apply the first time an owner or operator of an existing facility renews the financial instrument (or resubmits financial test documentation), or updates the cost estimates under the revised regulations.

The rule for calculating the inflation adjustment factor for the first time under the May 2, 1986 rules will depend on when the cost estimate was last adjusted for inflation under the previous regulations AND the anniversary date of the financial assurance mechanism (or the fiscal year-end date for financial test users). These rules are discussed below.

- Rule I: If the cost estimate was last updated between October 29, 1985 and March 1, 1986, and the next update is required between October 29, 1986 and March 1, 1987 (i.e., the anniversary date of the financial instrument or the fiscal year-end date falls within this period), the inflation adjustment factor is calculated by dividing the 1985 Deflator by the 1984 Deflator.¹⁹
- Rule II: If the cost estimate was last updated between March 1, 1986 and October 28, 1986, and the next update is required between October 29, 1986 and March 1, 1987, no adjustment for inflation is required until the period between October 29, 1987 to March 1, 1988. These owners or operators have already updated their estimates to account for 1985 inflation.
- Rule III: If the cost estimate was last updated between October 29, 1985 and March 1, 1986, and the next update is required between March 1, 1987 and October 28, 1987, the inflation adjustment factor is calculated by dividing the 1986 Deflator by the 1984 Deflator. These owners or operators must adjust their estimates to reflect 1984 and 1985 inflation.

¹⁹ Owners or operators with financial instrument renewal dates between October 29, 1986 and December 27, 1986, will not have the full 60 days to update their cost estimates. Similarly, owners or operators using a financial test with a fiscal year ending between October 1, 1986 and October 27, 1986 will have less than 30 days to update their estimates. In these situations, owners or operators may wish to contact the Regional or State Office or the RCRA Hotline to obtain the Deflators as quickly as possible.

Rule IV: If the cost estimate was last updated between March 1, 1986 and October 28, 1986, and the next update is required between March 1, 1987 and October 28, 1987, the inflation adjustment factor is calculated by dividing 1986 Deflator by the 1985 Deflator.

4.5 DOCUMENTATION FOR COST ESTIMATES

Although the regulations do not specify the format to be used for closure and post-closure cost estimates or the level of detail to be provided, the cost estimates must contain sufficient detail to allow the Regional or State Office to evaluate their accuracy. Documentation for the cost estimates should clearly delineate all activities and subactivities consistent with those described in the closure and post-closure plans and include the fully loaded costs of closure and post-closure care, including the costs of labor, equipment, and contingency fees. Documentation supporting cost estimates should also clearly reflect that such estimates are based on third-party costs where required. Five sources that might be used in developing cost estimates for the activities listed in the closure and post-closure plan are:

- (1) Guidance Manual: Cost Estimates for Closure and Post-Closure Plans (Subparts G and H), November 1986, available through EPA Regional Offices (OSWER Policy Directive Number 9476.00-6);
- (2) Owner or operator experience;
- (3) Contractor estimates;
- (4) Cost estimating handbooks; and
- (5) Worksheets and workups.

These data sources are described in more detail below.

4.5.1 Guidance Manual: Cost Estimates for Closure and Post-Closure Plans (Subparts G and H)

This EPA guidance manual contains guidance and information on key cost components and ranges of unit costs applicable to closure and post-closure care activities. The manual is organized into four volumes:

- Volume I contains worksheets outlining cost components applicable to facilities with tank, container storage, and incinerator units;
- Volume II contains worksheets outlining cost components applicable to land disposal units;

- Volume III contains information on unit costs of key closure and post-closure care activities (e.g., final cover, certification); and
- Volume IV contains detailed documentation of the unit costs.

4.5.2 Owner or Operator Experience

In many cases, the most readily available source of cost information for existing facilities will be operating records. For example, if an owner or operator routinely ships wastes off site to a TSDF and intends to follow the same procedures during closure, an estimate of the costs of treating or disposing of inventory at closure may be derived from contractor invoices. If an owner or operator intends to construct a cell as part of closure procedures, records of the costs of excavation, installing liners, ground-water monitoring, etc., should be available from internal records. Records from previous partial closures including contracts and invoices for installing final covers, decontaminating facility equipment and soil, and installing security equipment also may provide information to support the cost estimate. Similarly, the costs of ground-water monitoring during the closure and post-closure care period may be similar to the costs of monitoring during the facility's active life.

The cost estimates must be based on the cost of hiring a third party to conduct closure and post-closure care activities. Thus, the owner or operator must include a factor for hiring third-party labor if current practices include in-house labor and activities.

4.5.3 Contractor Estimates

Many cost estimates, particularly for those services that are to be purchased from a contractor or contractors, may be obtained from the contractor themselves. It is not necessary for documentation purposes to have written and validated cost estimates; a record of the party contacted, the date of the contact, and the estimates given is sufficient.

4.5.4 Cost Estimating Handbooks

Three widely used cost estimating handbooks are the Means Mechanical Cost Data, the Means Construction Cost Data, and the Means Site Work Cost Data, which are published and updated annually by Robert Snow Means Company, Inc. Care should be taken in using such manuals. For example, some manuals include costs of administration, normal contingencies, and profits in their unit costs estimations, whereas others do not. In some cases, theoretical work rates must be adjusted to normal field conditions and to include administrative costs.

4.5.5 Worksheets and Workups

Detailed workups of the costs should include an estimate of labor, equipment, energy, and material needs; the basis for these assumptions and the total time required for each activity should be included in the workup. Costs for supervision and administration should be added and adjustments made to account for fully loaded labor and equipment costs.

APPENDIX A

CLOSURE TIMELINES

This appendix contains four timelines that reflect key closure activities and the timeframes in which those activities are conducted. The activities include those performed by the owner or operator in conducting closure and the administrative activities performed by the Regional or State Office during the review and approval of closure plans. These timelines assume that closure activities and plan approval are completed by the deadlines specified in Subpart G. However, the timelines also identify points in time at which extensions to the deadlines may be granted.

The timelines are based on the status of closure plan approval. Therefore, the four timelines address:

- (1) Permitted and interim status facilities with approved plans for surface impoundment, waste pile, landfill, and land treatment units; (Exhibit A-1);
- (2) Permitted and interim status facilities with approved plans for container storage, tank, and incineration units (Exhibit A-2);
- (3) Interim status facilities without approved plans for surface impoundment, waste pile, landfill, and land treatment units (Exhibit A-3); and
- (4) Interim status facilities without approved plans for container storage, tank, and incineration units (Exhibit A-4).

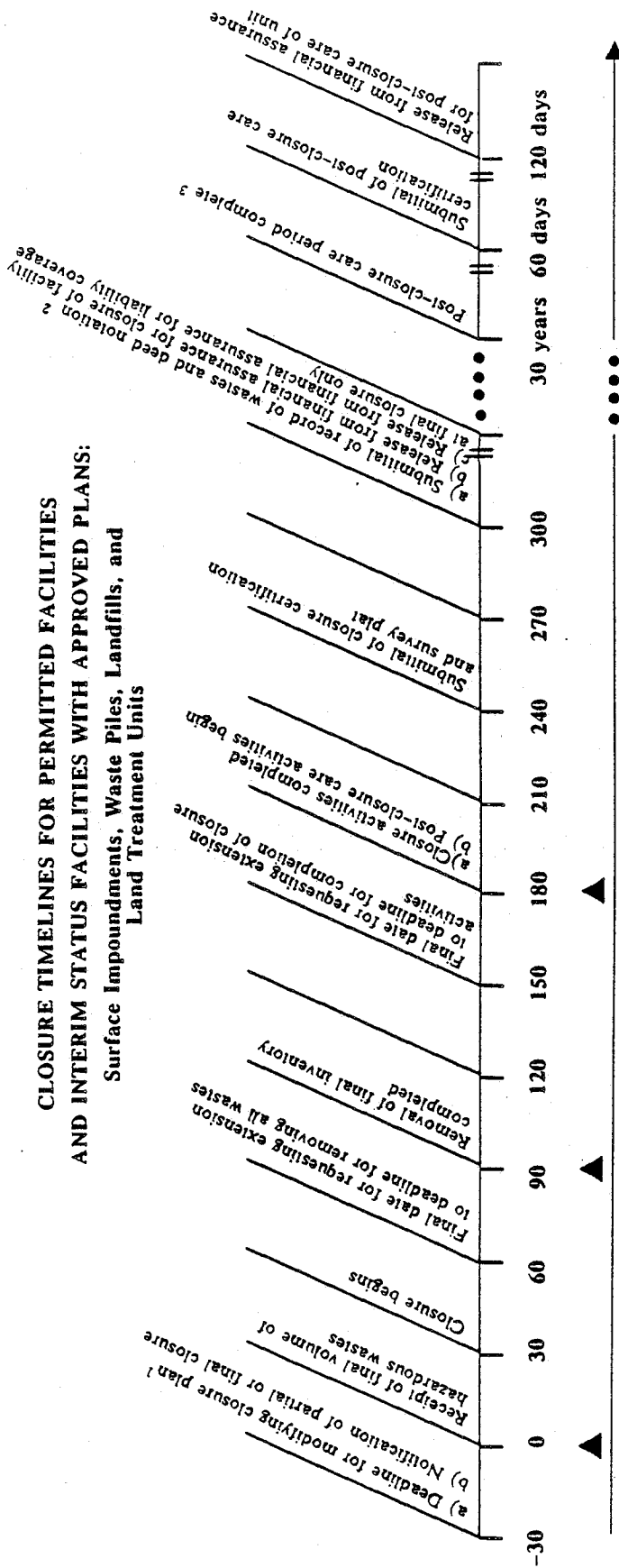
The following notes may be helpful when using the timelines:

- Receipt of the final volume of hazardous waste occurs at day zero;
- The days correspond to days before or after receipt of the final volume of hazardous waste, with events that occur before that point taking place on "negative" days. The regulations generally measure the closure deadlines from the date of receipt of the final volume of hazardous waste. The deadlines for submission of closure plan and notification of closure, however, are triggered by the "expected date of closure (i.e., within 30 days after the final receipt of hazardous wastes or longer if approved by the Regional or State Office)." In order to minimize confusion that might result if deadlines used different benchmarks, all deadlines including those for submitting the closure plan and notification, use receipt of the final volume of hazardous waste as a benchmark. For example an owner or operator must notify of the intent to close a landfill cell 60 days prior to the expected date of closure. This deadline is denoted on Exhibit A-1 as 30 days prior to the final receipt of hazardous waste;

- The timelines are designed so that the deadline is the last possible day that an event may take place, unless a variance or extension of time is obtained by the owner or operator;
- The legend indicates the points in time when extensions or variances may be requested;
- The description of the event taking place occurs immediately above and to the right of the day by which it must take place; and
- "O/O" refers to the facility owner or operator and "RA" refers to the Regional Administrator.

EXHIBIT A-1

**CLOSURE TIMELINES FOR PERMITTED FACILITIES
AND INTERIM STATUS FACILITIES WITH APPROVED PLANS:
Surface Impoundments, Waste Piles, Landfills, and
Land Treatment Units**

**LEGEND**

- ▲ Extension may be granted
- On-going post-closure care activities
- || Change in timeline scale

¹ The O/O must submit a written request for a permit modification no later than 60 days after an unexpected event has occurred which has affected the closure plan. If such an event occurs during the partial or final closure period, O/O must request a permit modification no later than 30 days after the unexpected event.

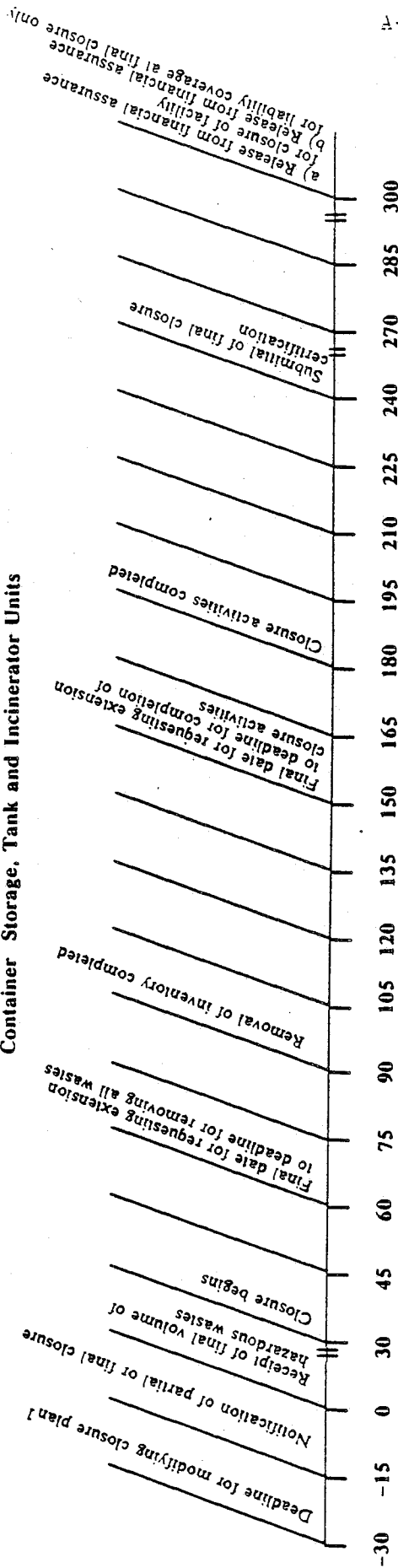
² The deed notation must be filed after closure of the FIRST hazardous waste disposal unit. Sixty days after closure of the LAST hazardous waste unit, the deed notice must be amended as necessary.

³ The RA can reduce or extend the post-closure care period.

EXHIBIT A-2

CLOSURE TIMELINES FOR PERMITTED FACILITIES
AND INTERIM STATUS FACILITIES WITH APPROVED PLANS:

Container Storage, Tank and Incinerator Units

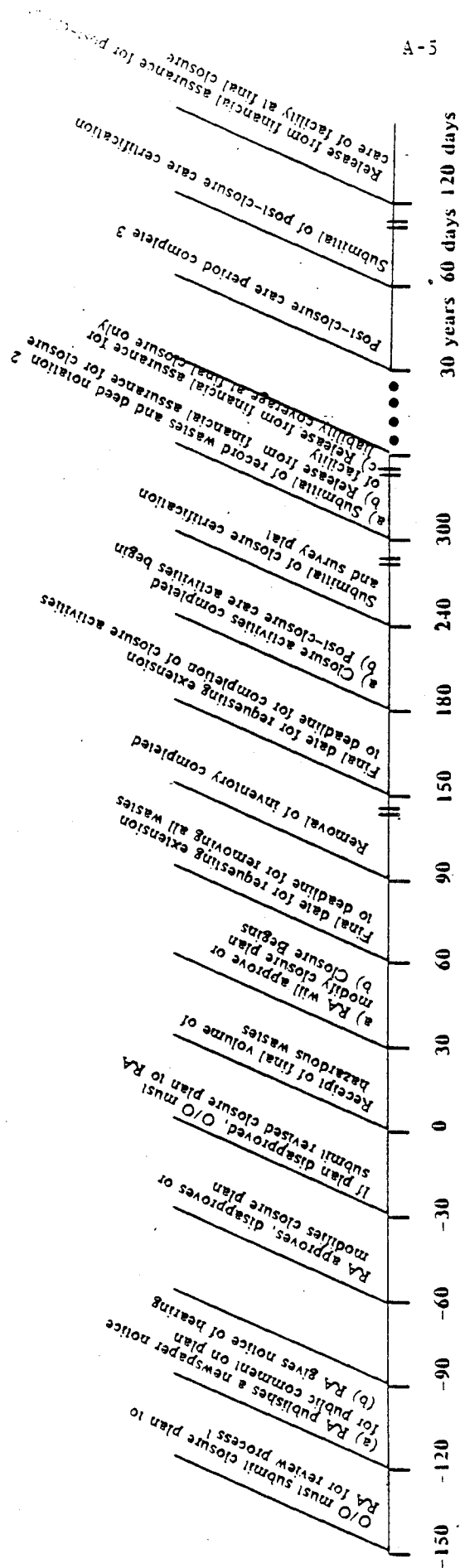


LEGEND

- ▲ Extension may be granted
- || Change in timeline scale

¹ The O/O must submit a written request for a permit modification no later than 60 days after an unexpected event has occurred which has affected the closure plan. If an unexpected event occurs during the partial or final closure period, O/O must amend the closure plan no later than 30 days after the unexpected event.

EXHIBIT A-3
CLOSURE TIMELINES FOR INTERIM STATUS
FACILITIES WITHOUT APPROVED PLANS:
Surface Impoundments, Waste Piles, Landfills,
and Land Treatment Units

**LEGEND**

- ▲ Extension may be granted
- || Change in timeline scale

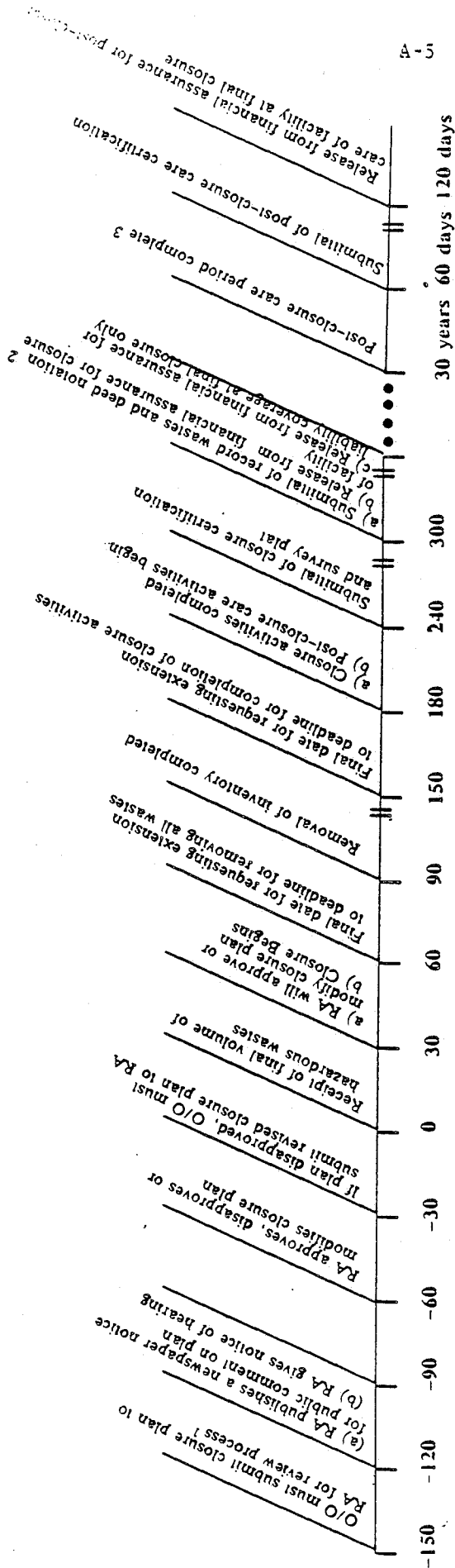
1 The O/O must submit his closure plan to the RA at least 180 days prior to the date he expects to begin closure.

2 The deed notation must be filed after closure of the FIRST hazardous waste disposal unit. Sixty days after closure of the LAST hazardous waste disposal unit, the deed notice must be amended as necessary.

3 The RA can reduce or extend the post-closure care period.

EXHIBIT A-3

CLOSURE TIMELINES FOR INTERIM STATUS FACILITIES WITHOUT APPROVED PLANS: Surface Impoundments, Waste Piles, Landfills, and Land Treatment Units



LEGEND

▲

Extension may be granted

||

Change in timeline scale

¹ The O/O must submit his closure plan to the RA at least 180 days prior to the date he expects to begin closure.

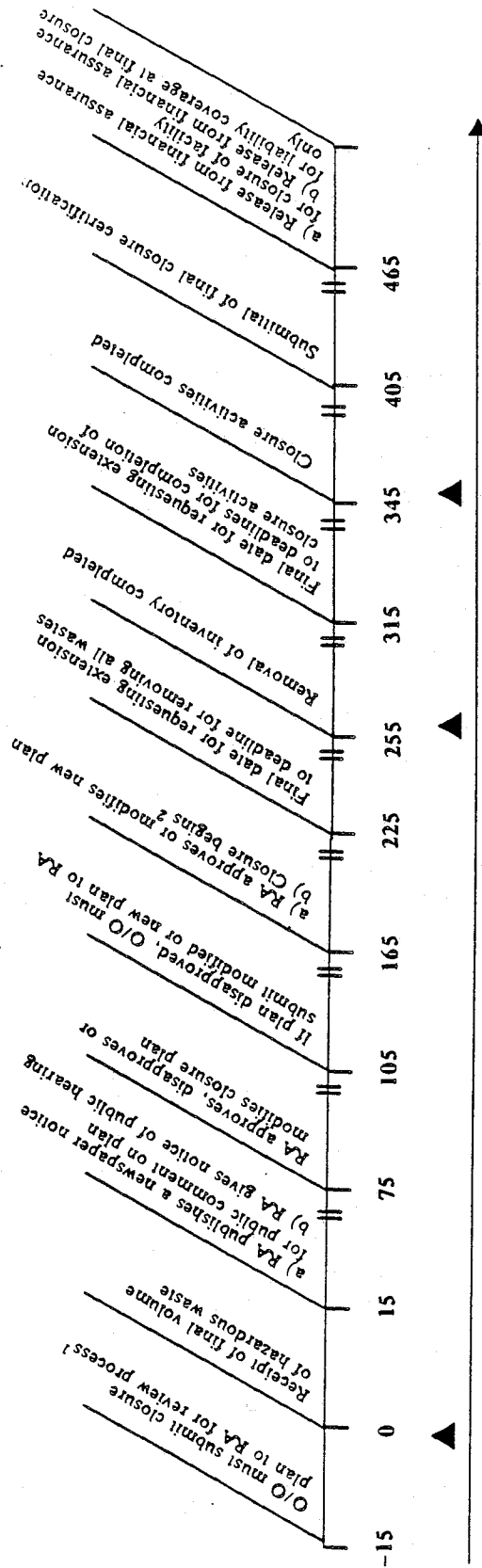
² The deed notation must be filed after closure of the FIRST hazardous waste disposal unit. Sixty days after closure of the LAST hazardous waste disposal unit, the deed notice must be amended as necessary.

³ The RA can reduce or extend the post-closure care period.

EXHIBIT A-4

CLOSURE TIMELINES FOR INTERIM STATUS FACILITIES
WITHOUT APPROVED PLANS

Container Storage, Tank and Incinerator Units



LEGEND

- ▲ Extension may be granted
- || Change in timeline scale

¹ The O/O must submit his closure plan to the RA at least 45 days prior to the date he expects to begin closure.

² O/O may begin conducting limited closure activities prior to plan approval but is not required to complete removal of inventory until 90 days after the plan is approved.

APPENDIX B

TECHNICAL EVALUATION CRITERIA AND SITE-SPECIFIC FACTORS TO CONSIDER IN DETERMINING THE LENGTH OF THE POST-CLOSURE CARE PERIOD

The Subpart G regulations give the Regional Administrator or State Director the authority to extend the length of the post-closure period beyond 30 years or reduce it on a case-by-case basis. He also may temporarily extend or reduce the length of the period or temporarily suspend certain activities based on cause. In addition, the owner or operator or member or the public may petition the Regional Administrator or State Director to change the length of the period.¹

This section suggests factors that may be appropriate to consider in evaluating the length of the post-closure care period and in preparing documentation to support a petition to extend or reduce the period. Section B.1 discusses broad technical criteria that should be examined and Section B.2 presents facility-specific technical factors that may affect the decision.

This appendix also presents a number of hypothetical scenarios illustrating how site-specific information might be used to support an extension or reduction in the length of the period. Although all of the scenarios are hypothetical, they indicate the types of information that should be examined and how the technical criteria and site-specific factors may be evaluated.

The hypothetical scenarios referenced in this appendix are not intended to represent all the possible situations that could be encountered. Rather, the scenarios describe the types of information that should be considered given a hypothetical set of facility conditions, present a decision under these particular conditions, and describe the rationale for the hypothetical decision.

B.1 Technical Evaluation Criteria to Consider in Determining the Length of the Post-Closure Care Period

The following four technical evaluation criteria provide a framework for assessing how well a unit or facility will protect human health and the environment:

- (1) **Containment** - How long will the unit or facility contain the wastes after closure?
- (2) **Detection** - Will the systems currently in place at the unit or facility detect releases of hazardous wastes?

¹ 40 CFR 124.5(a), 265.118(g), and 270.41.

- (3) Migration and Attenuation - Will the wastes migrate off site, and will the leachate be attenuated in the environment?
- (4) Risk Potential - Who potentially will be exposed to a waste release, how toxic are the waste constituents, and, consequently, what risks are involved?

B.1.1 Containment

The first and foremost objective for the design and operation of any disposal unit is the isolation of the hazardous wastes. Thus, when evaluating the containment criteria, emphasis should be placed on determining when a likely release of leachate will occur and its potential magnitude.

The most important parts of a containment system are the liner (single, double, or triple) and the cover or cap. The purpose of the liner is to contain the wastes in place and minimize ground-water contamination. The cap is designed to minimize infiltration of water into the unit, and thereby prevent the formation of leachate. (Generally, land treatment units are not capped because they are designed for waste degradation rather than waste containment. This distinction is discussed more fully in Section B.2.1.1.)

Improvements in landfill technologies (e.g., double synthetic liners) generally will result in longer, though not permanent, waste containment. Virtually every disposal facility, no matter what the design, will eventually leak and release leachate. Releases due to improper design, construction, installation, or operation of the unit are more likely to occur and be detected prior to the end of the 30-year post-closure care period. Releases due to the eventual degradation or wearing-out of the containment devices may take longer than 30 years to occur. Nevertheless, because most wastes contained within landfills undergo limited chemical or biological degradation as a result of the isolation, toxicity, and volumes of the wastes, releases caused by the eventual wearing-out of a facility will still pose a significant risk to human health and the environment. The processes and rates of hazardous waste degradation will vary for different chemicals and for site-specific conditions found at facilities, including chemical/physical properties (e.g., anaerobic or aerobic conditions, potential pH) and biological properties (e.g., the specific microbial population within the landfill cell). In most cases, biological degradation of hazardous waste constituents will occur at very slow rates because microbial populations are limited by the highly contaminated environment. In addition, many of the constituents that promote microbial growth, and therefore chemical degradation, such as light, water, and oxygen, are restricted by the landfill cover. Therefore, significant degradation of hazardous wastes will not begin until the wastes have been released from the containment systems.

In summary, based on purely technical considerations concerning containment, any slowly degradable toxic waste that is placed in a landfill or other containment facility has the potential to damage human health and the

environment. Moreover, this damage may occur over a very long timeframe well in excess of the standard 30-year post-closure care period. As a result, monitoring until all the soluble hazardous wastes have been removed or have leached off site, or until the owner or operator has demonstrated that local environmental conditions will limit potential ground-water contamination to acceptable levels may be appropriate.

B.1.2 Detection

Monitoring for leachate generation and releases serves as the most effective means of checking the integrity of a hazardous waste management unit during the post-closure care period. If wastes are detected beyond the containment boundaries, corrective action can be taken to prevent continued migration of the wastes off site. In evaluating ground-water monitoring results, it is important to keep in mind that there is a lag between leachate generation and release and migration to the point of detection. In addition, in some cases, improper well placement in relation to containment facility configuration, well construction, ground-water movement, and characteristics of the leachate migration may preclude detection of a release. If leachate is detected, the results may indicate that either corrective action is warranted or extended post-closure monitoring is needed to ensure that the release does not pose a threat to human health and the environment.

B.1.3 Migration and Attenuation

The extent to which leachate will migrate and pose a threat is a function of two general factors: (1) environmental transport (e.g., ground-water discharge rates) and (2) waste characteristics (e.g., adsorptivity and degradability).

If migration of a release is expected to be very slow, then virtually no risks may be associated with a release over the short term because the wastes will not contaminate drinking water supplies that are in use. In such a case, post-closure care monitoring would have to be extended over a very long period to ensure that a slowly moving contaminant plume would be detected. On the other hand, rapid migration would allow for earlier detection but may also pose a greater threat to drinking water supplies. Thus, the predicted migration patterns and rates will affect the determination of an appropriate duration for post-closure care monitoring.

The extent to which wastes have degraded during containment is also important to the evaluation of the long-term hazards. For example, land treatment facilities are designed to promote continuing degradation; therefore, the danger of serious releases from those units or facilities presumably will decline over time. In contrast, the isolation of wastes in landfills can actually inhibit degradation, thereby maintaining the hazardous constituents over a longer period. In addition, many hazardous wastes simply do not readily degrade.

B.1.4 Risk Potential

The overall risks stemming from hazardous waste management are determined by the likelihood of exposure to the waste, and the effects associated with that exposure. The severity of a release is a function of the leachate concentration at the point of release, and more importantly, the leachate concentration at the point of exposure. If a unit's containment systems degrade very slowly, the structure of the liners (if present) should attenuate the leachate migration rate and limit the releases to low concentrations over long periods of time. In addition, the leachate may further adsorb, degrade, and otherwise be attenuated in the environment. Finally, only low levels of risk may be associated with chronic exposures at low concentrations to certain waste constituents. If only "low toxicity" wastes are present in a unit or facility, the risk associated with exposure to these wastes would be relatively low. These several factors, alone or in combination, may limit the risks associated with a release from a unit or facility and, therefore, lessen the need to extend the post-closure ground-water monitoring period.

B.2 Site-Specific Technical Factors Involved in Evaluating the Length of the Post-Closure Care Period

Exhibit B-1 summarizes the relationship between the general evaluation criteria discussed in Section B.1 and the site-specific technical factors. The exhibit also identifies the types of information that could support a request to the Regional Administrator or State Director to alter the length of the post-closure care period. The three categories of facility-specific factors are:

- (1) Facility characteristics;
- (2) Waste type and characteristics; and
- (3) Environmental and health considerations.

Although these three categories are addressed separately, they cannot and should not be assessed independently of one another. For example, in assessing the adequacy of a facility's design, its environmental setting and the types of wastes that are being contained must also be examined. To help illustrate how site-specific technical factors may influence the length of the post-closure care period, the following sections refer to hypothetical scenarios summarized on Exhibit B-2. These scenarios are intended for illustrative purposes only and should not be considered directly applicable to any particular facility. However, they may help to clarify the kinds of information that deserve consideration.

B.2.1 Facility Characteristics

An assessment of the following facility characteristics will give a general indication of the expected ability of the facility to contain wastes over the long term:

EXHIBIT B-1

SUMMARY OF CONSIDERATIONS FOR EVALUATING THE
LENGTH OF THE POST-CLOSURE CARE PERIOD

GENERAL EVALUATION CRITERIA	SITE-SPECIFIC TECHNICAL FACTORS		ANALYTICAL COMPONENTS
Containment	Cap		Materials (clays, synthetics), permeability, soil and vegetative cover
	Liner		Materials (clays, synthetics), permeability, compaction
	Facility Design		Structural stability, topography
	Post-Closure Care Experience		Maintenance, inspections, repair procedures
	Environment		Precipitation, flood plains, soil types, depth to ground water
	Waste Characteristics		Effect on containment, long-term degradability
	Corrective Action		Effect on containment, maintenance
Detection	Leachate Collection		Possibility of "short-circuit" of leachate through collection system, stability, sampling and analysis schedule, history of leachate collected
	Ground-Water Monitoring		Hydrogeology, well location, well number and depth, background concentrations, sampling and analysis schedule
Migration and Attenuation	Unsaturated Zone Monitoring		Soil type, waste degradation rates, sampling and analysis schedule, history of waste concentration measurements
	Ground Water		Depth to ground water, hydraulic gradient, hydraulic conductivity
	Surface Water		Slope, precipitation, flood plains
	Waste Characteristics		Adsorptivity, degradability, reactivity, solubility, volatility, viscosity
Risk Potential	Subsurface Media		Adsorption sites, geochemistry
	Waste Toxicity		Acute and chronic toxicity, general health hazards, ecotoxicity
	Exposures		Drinking water well locations and depths, surface waters, bioaccumulation
	Population Characteristics		Populations of drinking water users, age distributions
Environmental Considerations			Surface waters, wetlands, land use, agriculture, ecologically sensitive habitat

EXHIBIT B-2
HYPOTHETICAL SCENARIOS ILLUSTRATING DECISIONS
ON THE LENGTH OF THE POST-CLOSURE CARE PERIOD

Scenario/Description	Factors to Consider	Decision	Rationale
1. A land treatment facility contains mildly hazardous waste and is being closed. The surrounding soil has low permeability and the treatment zone is three feet above the seasonally high water table. Ground water is the sole source of drinking water for a nearby town. Unsaturated soil monitoring results indicate contamination levels slightly above background.	<ul style="list-style-type: none"> - Amount and type of wastes disposed in the facility - Depth to the water table - Potential migration of contaminants from the facility - Direction and rate of ground water flow - Likely contamination of drinking water wells - Analysis of monitoring results to determine whether contamination is statistically detectable 	Maintain the length of the post-closure care period at 30 years. The RA can reevaluate unsaturated zone monitoring results at a later date to determine whether the post-closure care period may be reduced or should be extended.	The combination of mildly hazardous wastes, low soil permeability, and a large treatment zone in a well-run facility suggest that ground-water contamination should be minimal. However, because the ground water is a sole drinking water source, monitoring should not be terminated until results indicate that background levels are no longer exceeded.
2. The facility contains a double-lined disposal surface impoundment equipped with a leachate detection system which satisfies 40 CFR 264.221(c). The impoundment contains mildly toxic wastes. No leaks have been detected 6 years into the post-closure care period. The ground water table is located 80 feet below the bottom of the impoundment (deep aquifer). The aquifer is a poor drinking water source. The facility is located in a sparsely populated area.	<ul style="list-style-type: none"> - Size of impoundment - Integrity of the liner system/containment system - Amount and type of waste substances disposed in the facility - Environmental fate of the waste substances - Population at risk - Future uses of the ground water 	Temporary reduction of post-closure care activities on a trial basis.	Ground water source is deep, and is a poor drinking water source. If containment system fails, ground-water source is deep and of such poor quality that minimal threat exists to human health and the environment. Aquifer is not hydrologically connected to aquifers currently or potentially used as drinking water sources in a way that would allow contaminants to migrate to these waters. Limited population at risk. Post-closure activities may be reinstated if a release is detected.

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EXHIBIT B-2
HYPOTHETICAL SCENARIOS ILLUSTRATING DECISIONS
ON THE LENGTH OF THE POST-CLOSURE CARE PERIOD

Scenario/Description	Factors to Consider	Decision	Rationale
3. A clay lined landfill (80 acre facility divided into 20 cells) contains municipal solid waste, paint sludges, and electroplating waste. The clay liner permeability is 10^{-5} cm/sec. Leachate has migrated off site and has contaminated the potential drinking water use aquifer underlying the site. Corrective action activities are being taken at the site to contain plume migration. Population of 20,000 with ² in 3m of the site.	<ul style="list-style-type: none"> - Amount and type of waste disposed in the facility - Concentration and type of contaminants in leachate plume - Rate of migration of the plume - Activities associated with corrective action - Potential expense to leachate plume - Population at risk 	Post-closure care period should be extended beyond 30 years.	Ground water corrective actions are being taken at the site. The poor liner design of the landfill suggests the potential for additional releases. A substantial population may be at risk. The aquifer underlying the site may be used as a potential drinking water source.
4. A landfill cell contains very hazardous waste, including trichloroethylene and cyanides. The landfill has a double liner and no evidence of ground-water contamination has been detected around the facility for the first ten years of the post-closure care period. The facility is located over highly permeable soils ³ (K=10 cm/sec) and over a deep sole-source aquifer.	<ul style="list-style-type: none"> - Amount and type of waste disposed in the facility - Integrity of the cap and overall containment system - Ability to detect releases over the short term - Likely migration of potential release - Population at risk 	Post-closure care and monitoring activities should continue for the duration of the 30-year period.	A lack of contaminant detection does not mean that a leak has not or will not occur. Such a risk poses a serious threat due to the toxicity of the wastes, the high permeability of the surrounding soil media, and the importance of the underlying aquifer.

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EXHIBIT B-2
HYPOTHETICAL SCENARIOS ILLUSTRATING DECISIONS
ON THE LENGTH OF THE POST-CLOSURE CARE PERIOD

Scenario/Description	Factors to Consider	Decision	Rationale
<p>5. A one hundred acre landfill is located in a 100-year flood plain. The facility is designed to handle 350,000 tons/yr at maximum design capacity. The site is filled in 20-acre units. The landfill is equipped with a well-designed liner and a leachate collection and removal system capable of removing leachate generated as well as rainfall which enters the active portion of the cell. At this point in time, 3 cells have been closed. The cells contain a variety of wastes including metals such as lead. One closed unit has experienced several leaks which have been repaired. The perimeter dike was flooded during a 100-year storm event and has been replaced. Leachate and run-off generated during the flooding event contained metals, trichloroethylene, and benzene in high concentrations. Ground-water monitoring systems are designed for each individual cell.</p>	<ul style="list-style-type: none"> - Characteristics of the liner and final cover - Maintenance of the ground-water monitoring system, the leachate control system, and the run-off control system at the facility - Amount and type of waste in the landfill - Mobility and expected rate of migration of waste - Site location, topography, and surrounding land use - Geological and soil profiles, and surface and subsurface hydrology 	<p>The owner/operator must perform 30-year post-closure care on the two cells that have already been closed. For the third closed cell that has experienced leaks, the post-closure care period is extended beyond thirty years to ensure continued ground-water monitoring. At the time of closure of the remaining two cells, facility conditions will be reexamined to assign post-closure care periods to these units and evaluate whether the periods for the previously closed cells should be extended.</p>	<p>Because the landfill cells are designed with independent monitoring systems, the post-closure periods are assigned on a per-unit basis. However, the facility's location and the toxicity, virtual non-degradability, and potential for migration in the environment of the metal wastes make it appropriate to reevaluate facility conditions as each unit is closed. Especially because one closed cell has experienced leaks, it is prudent to ensure that ground-water monitoring continues long enough to detect releases from all units.</p>

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EXHIBIT B-2
HYPOTHETICAL SCENARIOS ILLUSTRATING DECISIONS
ON THE LENGTH OF THE POST-CLOSURE CARE PERIOD

Scenario/Description	Factors to Consider	Decision	Rationale
6. Several lined surface impoundments on a site are to be closed. The closure plan provides for the removal of all standing liquids, and stabilization of remaining wastes, waste residues and contaminated materials. The first phase of the closure plan will result in: (1) the removal of all liquids; (2) the chemical fixation of all sludges in the ponds; (3) the backfilling of the ponds with clean soil. Wastes placed in the disposal unit contain toluene, carbon tetrachloride, and methylene chloride. The final cover will consist of a synthetic membrane liner, a drainage layer, and protective and vegetative covers. Leachate will be sampled for pH, chlorinated organics and specific conductance. The aquifer underlying the site is used as a drinking water source.	<ul style="list-style-type: none"> - Permeability of the liner materials--clay and geotextiles - Pressure head of leachate on liner - Climatic conditions in area - Physical and chemical properties of soil that supports liner - Potential for damage to the liner system - Volume of leachate/run-off produced at the facility - Options for managing leachate/run-off collected at the facility - Design of the ground water monitoring system; sampling schedule for wells - Amount and type of waste disposed in the facility - Migration of the wastes in the event of a release - Potential population exposed to a release and at risk 	The owner/operator must perform 30 years of post-closure care. An extension to the care period may be needed if contaminant concentrations exceed ground-water standards set for the aquifer.	The aquifer under the site is currently used and supplies drinking water to a large town located 2 miles from the site. Therefore, there is a significant population at risk.

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EXHIBIT B-2
HYPOTHETICAL SCENARIOS ILLUSTRATING DECISIONS
ON THE LENGTH OF THE POST-CLOSURE CARE PERIOD

Scenario/Description	Factors to Consider	Decision	Rationale
<p>7. The facility is a 50-acre landfill located in a remote and arid area. The facility is lined with a 2-foot, thick clay liner. Annual precipitation is low, but the area is subject to heavy rains in the early spring. Wastes have accumulated to a maximum of 20 feet above grade. The wastes disposed in the facility include waste solvents, pesticides, tar residues, and oily sludges. The site is located in sandy-clay soils with slow to moderate permeability. Depth to ground water varies from 15-30 feet. The aquifer is currently in use. The ground water serves as the water supply for a sparsely populated residential area. A small stream containing game fish is located approximately 1/3 mile from the site. The slope of the landfill is slightly eroded, and runoff is reaching the stream, contributing to occasional flooding during peak rainfalls. Low levels of chlorinated organics have been detected in the drinking water supply of residents located near the site in the 20th year of the facility's post-closure care period.</p>	<ul style="list-style-type: none"> - Integrity of clay materials lining the facility - Stability of western slope of landfill - Volume of leachate generated and integrity of the leachate collection system - Limits of the permeability of the clay - Solubility of the waste materials - Concentration of constituents in the runoff reaching the stream - Ground water gradient and flow rate - Amount and type of wastes in the landfill - Population at risk 	<p>The post-closure care period should be extended by five years to ensure that levels of contaminants in drinking water do not increase the risk of harm to human health. Regrading of western slope should also be undertaken to ensure the structural integrity of the landfill. The period will be reevaluated after five years to determine if another extension is required.</p>	<p>An extension is appropriate because the potential exists for extensive ground-water contamination and for further failures of the landfill, which could both increase human health risks and danger to the environment.</p>

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- (a) Process type;
- (b) Facility design;
- (c) Waste management (operational) practices; and
- (d) Corrective action activities.

B.2.1.1 Process Type

Landfills, land treatment units, and disposal surface impoundments retain hazardous wastes after closure. In addition, storage impoundments, waste piles and tank systems that cannot be "clean closed" also must be closed as landfills.

Land treatment is designed to promote the degradation of constituents placed in or on the treatment zone, to transform them into non-hazardous constituents, or to immobilize them. The purpose of the post-closure care period is to allow continuing degradation of the wastes in the unit. Thus, the post-closure care period in effect serves as an extension of the active life of the land treatment unit. If an owner or operator of a land treatment unit expects that the waste constituents will degrade before the end of the 30-year post-closure care period, he may submit a demonstration to the Regional Administrator or State Director in accordance with the provisions in 40 CFR 264.280(d) showing that the level of hazardous constituents in the treatment zone does not exceed background values. (See Scenario 1 in Exhibit B-2.) In contrast to land treatment facilities where hazardous constituents are assumed to become non-hazardous over time, post-closure activities at all other types of units closed as landfills are designed exclusively to contain the hazardous wastes over the long term.

B.2.1.2 Facility Design

The function of a waste management system is to CONTAIN and DETECT the formation and minimize the escape of leachate, gases, and solids from the unit into the environment. Facility design characteristics which may influence the length of the post-closure care period are:

- Facility size;
- Liner;
- Final cover;
- Leachate collection, detection and removal systems;
- Control of run-on and run-off, and
- Ground-water monitoring system.

Facility Size. Facility size could be important if the facility has numerous disposal units and operates for a large number of years. A typical landfill operation closes individual cells as their disposal capacity is reached. Therefore, for facilities that contain many cells and continue operating over a long time span, an individual cell could be receiving hazardous waste 30 years or more after the first cell at the facility was closed. In this situation, some units will be conducting post-closure care activities while others will be actively receiving wastes. Unless the cells are hydrologically independent and have separate containment and monitoring systems, it may be appropriate to evaluate the length of the post-closure care period on a facility-wide rather than on a per-unit basis.

Liner. Liners are required for landfills, surface impoundments and waste piles to contain and prevent migration of leachate from a unit or facility. The effectiveness of a liner or liner system may vary according to the number of liners, the liner thickness, and the liner materials.²

Disposal units are often lined with compacted clay soils or synthetic materials. Both types of liners can react with certain wastes thus causing liner degradation and increasing the permeability of the liners over time. For example, strong acids capable of dissolving soil components increase the permeability of clay barriers, and some organic solvents degrade synthetic liners. The likelihood of liner degradation should be evaluated individually, because the processes depend on the site-specific composition of both the leachate and the liner material.

Although liners may remain effective in preventing waste migration from the unit until well after closure, their principal role occurs during the active life of the unit. While the unit is operational, the liner is relied upon to contain the hazardous wastes. Liquids are removed during operation of the facility, at closure, and during post-closure care, to further protect the integrity of the liner. Scenario 2 in Exhibit B-2 illustrates how the integrity of the liner system may influence the decision about the length of the post-closure care period.

Final Cover. A final cover that remains viable prevents releases by minimizing leachate formation through infiltration. Cover materials may include clay, synthetic liners, or natural soil, all of which may vary in thickness and may or may not have an upper vegetative covering. The regulations specify, however, that the cover must be at least as impermeable as the bottom liner.³ In addition, if a synthetic layer is used in the

² 40 CFR 264.221(c), 264.301(c), 265.221(a), and 265.301(c) require double liners and leachate collection systems for new impoundments and landfills, and §§264.251 and 265.251 require single liners and leachate collection systems for new waste piles which will reduce some of the variations currently found in facility designs.

³ 40 CFR 264.310 and 265.310.

bottom liner, a synthetic layer must also be used in the cover. Because of the importance of the final cover in preventing releases, the Regional Administrator or State Director should consider how well the cover has performed during the post-closure care period to date.

Leachate collection, detection, and removal systems. Most surface impoundments, waste piles and landfills are required to have leachate detection and removal systems installed above the lowest liner. New landfill units must have leachate collection systems both above and below the upper liner.⁴ The owner and operator must continue to operate the leachate collection and removal system during the post-closure care period until leachate is no longer detected. If leachate is generated well into the post-closure care period, this could suggest a cover or liner failure warranting an extension of the post-closure care period. On the other hand, if leachate is not detected or collected in the system, the Regional Administrator or State Director should evaluate whether the leachate collection system is functioning properly, i.e., whether it is capable of withstanding chemical attack from leachate-containing materials in the facility, whether it can withstand pressure from the weight of the overlying waste, and whether it functions without clogging.

Control of run-on and run-off. Various structures such as dikes, berms, freeboard, foundations and above-ground structures must be maintained during the post-closure care period to control run-on and run-off and aid containment. Because such structures are integral to the prevention of leachate formation, both the design of the structure and its maintenance will affect the facility's ability to prevent releases and may influence the appropriate length of the post-closure care period.

Ground-water monitoring system. Ground-water monitoring is the primary means of detecting leachate releases and must be continued at disposal facilities throughout the post-closure care period. In addition to reviewing the results of monitoring tests, the reliability and sensitivity of the ground-water monitoring system should be examined before accepting the results at face value. Contaminants in ground water experience relatively little mixing or dispersion, and, as a result, plumes of these contaminants remain concentrated. The plumes move slowly through most aquifers (generally in the range of five to 50 feet/year) and typically remain for many years. An individual plume may underlie only a very small part of the land surface and therefore can be extremely difficult to detect. If, for example, the integrity of the containment is in doubt yet the ground-water monitoring system has not detected any contamination, the construction of additional wells and continuation of the monitoring period may be appropriate.

⁴ 40 CFR 264.221(c), 264.251(c), 264.301(c), 265.221(a), 265.254, and 265.301(a).

B.2.1.3 Waste Management (Operational) Practices

Even the best-designed unit or facility must be managed properly in order to prevent releases. Improper management during a facility's active life (including early years of post-closure care for units closed prior to final closure) could put excessive stress on facility structures or could result in contamination of subsoils that might only be discovered as ground-water contamination during the post-closure care period. The following management practices are among those that help to ensure facility integrity:

- Routine maintenance and inspections designed to detect equipment malfunctions and physical damage to final cover (e.g., cracks, erosion);
- Emergency procedures to handle natural disasters and catastrophic events (e.g., flooding caused by a meteorological event);
- Fast and efficient responses to accidents/spills that may occur; and
- Good compliance records.

Although sound waste management practices are not in themselves sufficient to justify a reduction in the length of the post-closure care period, a well-managed facility is more likely to maintain its structural integrity and have monitoring records that could support such a reduction. On the other hand, poor management practices may justify an extension of the period to the extent that these practices have increased the likelihood of a serious release occurring which would result in a threat to human health and the environment and the potential need for corrective action. For example, a history of frequent spills during the operating life of a facility may suggest that the post-closure care period should be extended to increase the likelihood that future ground-water contamination resulting from these spills is detected and corrective action is undertaken if needed. Information on waste management practices (e.g., reports from on-site inspections; records of violations and compliance orders issued; documentation regarding closure plan review; and partial and final closure certifications) should be readily available to the Regional Administrator or State Director.

B.2.1.4 Corrective Action Activities.

Depending on the timing of a release and the duration of the corrective action, the compliance period and corrective action may extend beyond the 30-year post-closure care period. The regulations do not specify, however, whether the post-closure period should be extended to be consistent with these requirements. Nevertheless, the Agency may consider requiring an extension of the post-closure period when the corrective action continues beyond the thirty-year post-closure care period to ensure that the contamination problem is not exacerbated by new releases from the containment system. Although compliance monitoring is conducted along with the corrective action, continued post-closure care detection monitoring would alert the Regional

Administrator of contamination that is more wide-spread than originally believed, or to additional releases that may occur. Scenario 3 in Exhibit B-2 illustrates the factors that should be considered at a facility undergoing corrective action.

B.2.2 Waste Types and Characteristics

As discussed in Section B.1, the migration and attenuation of the waste determine how widely the waste may be dispersed in the environment and whether the release will ultimately lead to human exposure. Thus, these factors determine the risk potential for the waste. If a unit contains toxic wastes which pose a significant environmental hazard due to their persistence and mobility, all else being equal, it may be appropriate to consider extending the post-closure care period. Waste characteristics are defined by the physical and chemical properties of the wastes, including:

- **Degradability:** The degradation rate is a function of the wastes' environment or surroundings. For example, a waste exposed to the atmosphere may be degraded by the process of photolysis (solar degradation) or hydrolysis (breakdown in water). In the soil, biodegradation may result from enzymatic actions. Degradation rates are higher in the uppermost portions of a soil profile because there is greater exposure to air, microorganisms and other biota which promote degradation. Therefore a substance remaining in the upper levels of soil will be more subject to degradation than one moving rapidly through the soil. Similarly, certain biodegradable substances, such as organic chemicals, are less likely to migrate to ground water in a hazardous state than non-biodegradable substances because microorganisms in the upper levels of the soil will cause them to degrade before they reach greater soil depths and the ground water.
- **Volatility:** The volatility of a substance refers to its tendency to separate into liquid and gas. This tendency depends upon such factors as the concentration of the substance, temperature, and vapor pressure. Certain organic solvents are highly volatile.
- **Solubility:** Solubility is the ability of a substance to be dissolved in liquids. A waste with highly soluble hazardous components (e.g., formaldehyde and phenol) would form a leachate with higher concentrations of hazardous constituents than a waste with hazardous components low in solubility (e.g., metals), given equal amounts of water and waste. Wastes with a high solubility will more readily travel from the waste disposal unit as leachate if water infiltrates through the cover and into the waste disposal unit and be more likely to contaminate the ground water than insoluble compounds. Moreover, wastes that are not readily degradable will have an even higher potential for contaminating ground water.

- **Adsorptivity:** Adsorptivity measures the tendency of a substance to cling to soil particles. Wastes containing substances with high adsorptivity, such as PCBs and lead, are easily bound to the soil, thus restricting their movement through soil to ground water. Therefore, while lead is not biodegradable, lead concentration in leachate will be attenuated due to adsorption.
- **Bioaccumulation:** Substances with a high bioaccumulation rate,⁵ such as PCBs, tend to accumulate in the tissues of plants or wildlife.
- **Kinematic viscosity:** The kinematic viscosity of a substance indicates the relative rate at which a fluid containing the substance would flow. Substances with low kinematic viscosity, such as many organic solvents, would form a leachate which flows more rapidly than water. Like adsorptivity, kinematic viscosity would indicate how rapidly a leachate might move toward ground water.
- **Toxicity:** A chemical causes acute toxicity if it leads to death or an illness soon after exposure. Chronic toxicity is associated with low levels of exposure to certain chemicals over long periods of time (e.g., exposures to a contaminated drinking water source). Chronic responses may include cancer or birth defects. A chemical may cause both acute and chronic toxic responses. The type of response is generally a function of the level and pathway of exposure. However, some substances can be acutely toxic even in minute quantities (e.g., arsenic, lead, mercury, and toxaphene).

In summary, an evaluation of the chemical and physical properties of a waste should indicate the potential for a waste reaching the ground water. For example, a waste with a very slow degradation rate but a low level of toxicity may cause less harm to the environment than a waste that degrades rapidly but is highly toxic. Consequently, post-closure care and monitoring may be extended for those wastes that would impose a higher degree of hazard over the long-term if released. Scenarios 4 and 5 in Exhibit B-2 illustrate how information about waste characteristics might be used in a facility evaluation.

⁵ The octanol-water partition coefficient is often used as a relative measure of the ability of a chemical to partition into the fatty tissues of an organism and therefore bio-accumulate.

B.2.3 Environmental and Health Considerations

Environmental considerations include information about the soil, ground water, topography, and climate such as:

- Unsaturated zone (soil)
 - identity of the subsurface media (e.g., soil and/or rock);
 - chemical composition of soil subsurface media;
 - soil porosity/bulk density/hydraulic conductivity;
 - type of surface soils.
- Saturated zone (ground water)
 - depth to ground water, distance to wells;
 - hydraulic gradient and hydraulic conductivity;
 - structural/geologic features (e.g., existence of aquitards, regions of relative impermeability acting as barriers to the movement of ground water);
 - ground water use;
 - direction and rate of ground-water flow.
- Topography and Geography
 - distance to surface water;
 - distance to property boundaries;
 - land formations, and other relevant features of the facility and site;
 - surface run-off patterns.
- Climatological Conditions
 - weather patterns;
 - precipitation;
 - temperature.

Waste constituents or their subsequent degradation or transformation products released to the environment also may pose risks to human health. While consumption of contaminated drinking water directly threatens human health, consumption of food products which have bioaccumulated toxic substances indirectly affects human health. Population density, uses of ground and surface water, and present and potential surrounding land use should be considered when gauging potential exposures and thus the cumulative level of risk.⁶ Scenarios 6 and 7 in Exhibit B-2 describe situations in which the population at risk would enter into the deliberations concerning post-closure care.

⁶ Strategies for protecting ground water have been a recent subject of EPA attention. Several states have also begun developing ground-water protection strategies. See: Environmental Protection Agency, "A Ground Water Protection Strategy for the Environmental Protection Agency," August 1984.

CLOSURE, CONTINGENT CLOSURE, AND POST-CLOSURE PLAN CHECKLISTS

This appendix contains checklists which identify the necessary types of information that should be addressed in a closure or post-closure plan. A closure plan checklist is provided for seven major types of hazardous waste management units:

- Container Storage and Handling Units;
- Tank Storage and Treatment Systems;
- Surface Impoundments;
- Waste Piles;
- Land Treatment;
- Landfills; and
- Incineration Systems.

Also included is a checklist identifying the activities to be included in a contingent closure plan required for permitted surface impoundments and waste piles that do not satisfy the specified liner requirements, and for permitted and interim status tank systems without secondary containment (see Section 2.1.3 of the main text). In addition, a post-closure plan checklist applicable to all facilities with disposal units is provided.

This appendix does not include checklists for miscellaneous hazardous waste technologies, such as placement of wastes in underground mines, thermal treatment other than incinerators (e.g., molten-salt pyrolysis, wet-air oxidation), open burning/open detonation of explosive wastes, certain chemical, physical, and biological treatment units, some water disposal activities, and research in miscellaneous units. These checklists may be provided at a later date as updates to this guidance manual.

The purpose of the checklists is to indicate the types of information to be included in a plan and to present a suggested format for organizing the information. The checklists also include the applicable regulatory citations for reference. The closure plan checklists are organized into three major sections:

- **Facility Description** -- Discusses design and operating information about the unit and the relationship of the unit to other hazardous waste management units, if any, at the facility to provide a basis for discussions of closure procedures;¹

¹ Where a Part B permit application has been submitted for the unit, much if not all of the information listed under Facility Description will have been presented in the application. The closure plan need only reference the appropriate sections of the Part B application where this information is to be found.

- Closure Procedures -- Describes the steps necessary to perform closure of the unit; and
- Closure Schedule -- Presents timing and scheduling information for all of the partial and final closure activities.

The suggested format for the post-closure plan checklist conforms to the key post-closure care activities, namely monitoring and routine maintenance activities.

Each checklist is designed to address all the possible types of information that may be necessary to include in a plan for that specific process type unit. Because site-specific conditions play a considerable role in shaping closure and post-closure plans, not all items on the checklist may be applicable to a particular unit or facility. For example, if all waste inventory from the closure of a tank storage system is to be sent off site for disposal, there will be no need to describe on-site treatment or disposal methods for these wastes. Similarly, if it can be demonstrated that there will always be sufficient capacity available in an operating landfill cell to dispose of waste inventory at any time during the active life of the facility, then there will be no need to provide information on the design and construction of a new cell.

For the convenience of the checklist user, each item on the checklist includes a space to note whether the specific information is provided in the plan or is "not applicable". In addition, it includes a corresponding space on the page to accommodate a brief written comment or note explaining why certain information is not applicable. This information may help to serve as an outline in preparing the closure plan, as well as a management tool for reviewing the plans.

In preparing or reviewing a closure plan for a multiple process facility, the user should refer to each of the applicable process-specific checklists. For example, for a facility comprised of container storage and handling units, tank treatment, and landfills, all three checklists should be used. Because the checklists address activities on a per-unit basis, the landfill checklist, for example, does not address the procedures for removing and handling the waste inventory associated with the treatment tank system. In preparing the closure plan, however, the owner or operator may choose to describe certain closure activities on a per-facility basis (see Section 2.2 of the main text).

CLOSURE PLAN CHECKLIST:

CONTAINER STORAGE AND HANDLING UNITS

EPA I.D. _____

CLOSURE PLAN CHECKLIST
CONTAINER STORAGE AND HANDLING UNITS

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
1. FACILITY DESCRIPTION	264.111/265.111			
1.1 General description (e.g., size, location)				
1.2 Topographic map				
1.3 List of other HWM units and wastes handled in each				
1.4 Hydrogeologic information:				
o Ground-water and soil conditions				
o Ground-water monitoring systems				
o Corrective actions				
1.5 Container storage unit description:				
o Wastes managed (EPA hazardous waste numbers & quantities)				
o Capacity: number and size of containers				
o Storage area design & ancillary equipment (including layout sketch)				
o Secondary containment design				
1.6 References to other environmental permits (NPDES, UIC, TSCA)				
1.7 Anticipated waivers or exemptions				
2. CLOSURE PROCEDURES				
2.1 Estimates of maximum quantity of inventory (by waste type) to be removed:	264.112(b)(3)/265.112(b)(3); 264.178			
o Containers				
o Bulk wastes				
o Residues				
o Empty containers				

EPA I.D. _____

CLOSURE PLAN CHECKLIST
CONTAINER STORAGE AND HANDLING UNITS

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
2.2 Procedures for handling removed inventory (address quantities, waste types, methods):	264.112(b)(3)/265.112(b)(3); 264.178			
o On-site treatment				
o On-site disposal				
o Transportation distance off-site				
o Off-site treatment				
o Off-site disposal				
2.3 Procedures for decontamination and/or disposal:	264.112(b)(4)/265.112(b)(4); 264.114/265.114; 264.178			
o Equipment/structures decontamination (address sampling protocol)				
o Cleaning agent/rinsewater treatment or disposal (address quantities, waste types, and methods):				
-- On-site treatment/disposal				
-- Off-site treatment/disposal				
o Equipment/structures demolition and removal (address quantities and methods):				
-- On-site treatment/disposal				
-- Off-site treatment/disposal				
o Contaminated soil removal:				
-- List or sketch of potentially contaminated areas				
-- Estimated amount of contaminated soil to be removed (address sampling protocol)				
-- Soil removal methods				
-- On-site disposal				
-- Off-site disposal				

EPA I.D. _____

CLOSURE PLAN CHECKLIST
CONTAINER STORAGE AND HANDLING UNITS

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
2.4 Description of security systems:	264.14(b) and (c)/ 265.14(b) and (c)			
o Posted signs and 24-hour surveillance system				
o fence or natural barrier				
2.5 Closure certification:	264.115/265.115			
o Activities to be conducted				
o Testing and analyses to be performed				
o Criteria for evaluating adequacy				
o Schedule of inspections				
o Types of documentation				
3. CLOSURE SCHEDULE				
3.1 Expected year of closure	264.112(b)(6)/265.112(b)(6)			
3.2 frequency of partial closures	264.112(b)(7)/265.112(b)(7)			
3.3 Milestone chart showing time for:				
o Removal, treatment or disposal of inventory	264.113(a)/265.113(a)			
o Decontamination equipment/structures				
o Equipment, structures demolition and soil removal/disposal				
o Total time to close	264.113(b)/265.113(b)			
3.4 Request for extension to deadlines for handling inventory or completing closure	264.113(c)/265.113(c)			

CLOSURE PLAN CHECKLIST:

TANK STORAGE AND TREATMENT SYSTEMS

EPA I.D. _____

CLOSURE PLAN CHECKLIST
TANK STORAGE AND TREATMENT SYSTEMS*

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
1. FACILITY DESCRIPTION				
1.1 General description (e.g., size, location)	264.111/265.111			
1.2 Topographic map				
1.3 List of other ILM units and wastes handled in each				
1.4 Hydrogeologic information:				
o Ground-water and soil conditions				
o Ground-water monitoring systems				
o Corrective actions				
1.5 Tank system description:				
o Wastes managed (EPA hazardous waste numbers & quantities)				
o Capacity: type, number and size of tanks				
o Tank area design & ancillary equipment (including layout sketch)				
o Secondary containment and leak detection system design				
1.6 References to other environmental permits (NPDES, UIC, TSCA)				
1.7 Anticipated waivers or exemptions				
2. CLOSURE PROCEDURES				
2.1 Estimates of maximum quantity of inventory (by waste type) to be removed:	264.112(b)(3)/265.112(b)(3); 264.197/265.197			
o Pumpable wastes in tanks				
o Residues in tanks				
o Contaminated containment liquids				

* See also Contingent Closure Plan Checklist for tank systems without secondary containment.

EPA I.D. _____

CLOSURE PLAN CHECKLIST
TANK STORAGE AND TREATMENT SYSTEMS*

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
2.2 Procedures for handling removed inventory (address quantities, waste types, methods):	264.112(b)(3)/265.112(b)(3); 264.197(a)/265.197(a)			
o On-site treatment				
o On-site disposal				
o Transportation distance off-site				
o Off-site treatment				
o Off-site disposal				
2.3 Procedures for decontamination and/or disposal:	264.112(b)(4)/265.112(b)(4); 264.114/265.114; 264.197/ 265.197			
o Tanks and other equipment/structures decontamination (address sampling protocol)				
o Cleaning agent/rinsewater treatment or disposal (address quantities, waste types, and methods):				
-- On-site treatment/disposal				
-- Off-site treatment/disposal				
o Tanks and other equipment/structures demolition and removal (address quantities and methods):				
-- On-site treatment/disposal				
-- Off-site treatment/disposal				
o Contaminated soil removal:				
-- List or sketch of potentially contaminated areas				
-- Estimated amount of contaminated soil to be removed (address sampling protocol)				
-- Soil removal methods				
-- On-site disposal				
-- Off-site disposal				

* See also Contingent Closure Plan Checklist for tank systems without secondary containment.

EPA I.D. _____

CLOSURE PLAN CHECKLIST
TANK STORAGE AND TREATMENT SYSTEMS*

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
2.4 Description of security systems:	264.14(b) and (c)/ 265.14(b) and (c)			
o Posted signs and 24-hour surveillance system				
o fence or natural barrier				
2.5 Closure certification:	264.115/265.115			
o Activities to be conducted				
o Testing and analyses to be performed				
o Criteria for evaluating adequacy				
o Schedule of inspections				
o Types of documentation				
3. CLOSURE SCHEDULE				
3.1 Expected year of closure	264.112(b)(6)/265.112(b)(6)			
3.2 Frequency of partial closures	264.112(b)(7)/265.112(b)(7)			
3.3 Milestone chart showing time for:				
o Removal, treatment or disposal of inventory	264.113(a)/265.113(a)			
o Decontamination of tanks and equipment/structures				
o Tanks, equipment, and structures demolition and soil removal/disposal				
o Total time to close	264.113(b)/265.113(b)			
3.4 Request for extension to deadlines for handling inventory or completing closure	264.113(c)/265.113(c)			

* See also Contingent Closure Plan Checklist for tank systems without secondary containment.

CLOSURE PLAN CHECKLIST:

SURFACE IMPOUNDMENTS AT WHICH ALL WASTES ARE REMOVED

EPA I.D. _____

CLOSURE PLAN CHECKLIST
SURFACE IMPOUNDMENTS: ALL HAZARDOUS WASTES REMOVED*

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
1. FACILITY DESCRIPTION				
1.1 General description (e.g., size, location)	264.111/265.111			
1.2 Topographic map				
1.3 List of other HWM units and wastes handled in each				
1.4 Hydrogeologic information:				
o Ground-water and soil conditions				
o Ground-water monitoring systems				
o Corrective actions				
1.5 Surface impoundments description:				
o Wastes managed (EPA hazardous waste numbers and quantities)				
o Number and size (aerial dimensions and depth) of impoundments (including engineering drawings)				
o Liner systems and leachate collection systems design				
o Run-on and run-off control systems				
1.6 References to other environmental permits (NPDES, UIC, TSCA)				
1.7 Anticipated waivers or exemptions				
2. CLOSURE PROCEDURES				
2.1 Estimates of maximum quantity of inventory (by waste type) to be removed:	264.112(b)(3)/265.112(b)(3); 264.228(a)/265.228(a)			
o Pumpable wastes in the impoundments				
o Bottom sludges/residues in the impoundments				
2.2 Procedures for handling removed inventory (address quantities, waste types, methods):	264.112(b)(3)/265.112(b)(3); 264.228(a)/265.228			

* See also Contingent Closure Plan Checklist for permitted impoundments without liner systems as specified in Section 264.221(a) (i.e., double liners)

EPA I.D.

CLOSURE PLAN CHECKLIST
SURFACE IMPOUNDMENTS: ALL HAZARDOUS WASTES REMOVED*

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
o On-site treatment				
o On-site disposal				
o Transportation distance off-site				
o Off-site treatment				
o Off-site disposal				
2.3 Procedures for decontamination and/or disposal:	264.112(b)(4)/265.112(b)(4); 264.114/265.114; 264.228(a)/ 265.228(a)			
o Equipment/structures (piping, pumps) decontamination (address sampling protocol)				
o Cleaning agent/rinsewater treatment or disposal (address quantities, waste types, and methods):				
-- On-site treatment/disposal				
-- Off-site treatment/disposal				
o Containment systems (liners, dikes) and other equipment/structures demolition and removal (address quantities and methods):				
-- On-site treatment/disposal				
-- Off-site treatment/disposal				
o Other contaminated soil removal:	264.228(a)/265.228(a)			
-- List or sketch of potentially contaminated areas				
-- Estimated amount of contaminated soil to be removed (address sampling protocol)				
-- Soil removal methods				
-- On-site disposal				
-- Off-site disposal				
o Protocol for determining "clean" closure				

* See also Contingent Closure Plan Checklist for permitted impoundments without liner systems as specified in Section 264.221(a) (i.e., double liners)

EPA I.D. _____

CLOSURE PLAN CHECKLIST
SURFACE IMPOUNDMENTS: ALL HAZARDOUS WASTES REMOVED*

SUBJECT REQUIREMENT	PART 264/265		NOI APPLICABLE	COMMENTS
	264.112(b)(5)/265.112(b)(5); 264.90/265.90			
2.4 Ground-water monitoring:				
o Number, location and frequency of samples				
o Procedures for analysis				
2.5 Description of security systems:				
o Posted signs and 24-hour surveillance system	264.114(b) and (c)/ 265.114(b) and (c)			
o fence or natural barrier				
2.6 Closure certification:				
o Activities to be conducted	264.115/265.115			
o Testing and analyses to be performed				
o Criteria for evaluating adequacy				
o Schedule of inspections				
o Types of documentation				
3. CLOSURE SCHEDULE				
3.1 Expected year of closure	264.112(b)(6)/265.112(b)(6)			
3.2 Frequency of partial closures	264.112(b)(7)/265.112(b)(7)			
3.3 Milestone chart showing time for:				
o Removal, treatment or disposal of inventory				
o Decontamination of equipment/structures	264.113(a)/265.113(a)			
o Containment systems, equipment, and structures demolition and soil removal/disposal				
o Total time to close	264.113(b)/265.113(b)			
3.4 Request for extension to deadlines for handling inventory or completing closure	264.113(c)/265.113(c)			

* See also Contingent Closure Plan Checklist for permitted impoundments without liner systems as specified in Section 264.221(a) (i.e., double liners)

CLOSURE PLAN CHECKLIST:

DISPOSAL SURFACE IMPOUNDMENTS

EPA I.D.

CLOSURE PLAN CHECKLIST
SURFACE IMPOUNDMENTS: CLOSURE AS A LANDFILL

SUBJECT REQUIREMENT

PART 264/265
NOT APPLICABLE
COMMENTS

1. FACILITY DESCRIPTION

1.1 General description (e.g., size, location)

1.2 Topographic map

1.3 List of other HWM units and wastes handled in each

1.4 Hydrogeologic information:

o Ground-water, soil, and geologic conditions

o Ground-water monitoring systems

o Corrective actions

1.5 Surface impoundment description:

o Wastes managed (EPA hazardous waste numbers & quantities)

o Number and size (aerial dimensions and depth) of impoundments (including engineering drawings)

o Liner systems and leachate collection systems design

o Run-on and run-off control systems

1.6 References to other environmental permits (NPDES, UIC, TSCA)

1.7 Anticipated waivers or exemptions

2. CLOSURE PROCEDURES

2.1 Estimates of maximum quantity of inventory (by waste type) to be removed:

o Pumpable wastes in the impoundments

o Bottom sludges/residues in the impoundments

2.2 Procedures for handling inventory to be treated/stabilized and replaced in the impoundments (consistent with land disposal restrictions under Part 268):

264.112(b)(3)/265.112(b)(3);
264.228(a)/265.228(c)

264.228(a)(2)/265.228(c)

EPA I.D.

CLOSURE PLAN CHECKLIST
SURFACE IMPOUNDMENTS: CLOSURE AS A LANDFILL

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
o Waste types and quantities				
o Treatment methods				
o Type and amount of stabilization reagent				
2.3 Procedures for handling other removed inventory (address quantities, waste types, methods)	264.112(b)(3)/265.112(b)(3); 264.228/265.228			
o On-site treatment				
o On-site disposal				
o Transportation distance off-site				
o Off-site treatment				
o Off-site disposal				
2.4 Procedures for decontamination and/or disposal:	264.112(b)(4)/265.112(b)(4); 264.114/265.114; 264.228/ 265.228			
o Equipment/structures (piping, pumps) decontamination (address sampling protocol)				
o Cleaning agent/rinsewater treatment or disposal (address quantities, waste types, and methods):				
-- On-site treatment/disposal				
-- Off-site treatment/disposal				
o Equipment/structures demolition and removal (address quantities and methods):				
-- On-site treatment/disposal				
-- Off-site treatment/disposal				
o Contaminated soil removal:				
-- List or sketch of potentially contaminated areas				
-- Estimated amount of contaminated soil to be removed (address sampling protocol)				

EPA I.D.

CLOSURE PLAN CHECKLIST
SURFACE IMPOUNDMENTS: CLOSURE AS A LANDFILL

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
-- Soil removal methods				
-- On-site disposal				
-- Off-site disposal				
2.5 Final cover design (including engineering drawings):	264.228(a)(2)/265.228(c)			
o Area covered				
o Cover Characteristics:				
-- Material type				
-- Permeability				
-- Depth				
-- Slope				
-- Drainage structures				
-- Vegetation				
o Installation procedures (equipment and labor requirements)				
2.6 Ground-water monitoring:	264.112(b)(5)/265.112(b)(5); 264.90/265.90			
o Types of analyses:				
-- Number, location, and frequency				
-- Procedures for analyses				
o Maintenance of equipment				
2.7 Description of security systems	264.14(b) and (c)/ 265.14(b) and (c)			
o Existing facility fence maintenance				
o Additional fencing at closure				
o Other security equipment				
2.8 Survey plat	264.116/265.116			
2.9 Closure certification:	264.115/265.115			
o Activities to be conducted				

EPA I.D.

CLOSURE PLAN CHECKLIST
SURFACE IMPONDMENTS: CLOSURE AS A LANDFILL

SUBJECT REQUIREMENT

PART 264/265 PROVIDED APPLICABLE NOT APPLICABLE COMMENTS

- o Testing and analyses to be performed
- o Criteria for evaluating adequacy
- o Schedule of inspections
- o Types of documentation

3. CLOSURE SCHEDULE

3.1 Estimated year of closure

264.112(b)(6)/265.112(b)(6)

3.2 Frequency of partial closures

264.112(b)(7)/265.112(b)(7)

3.3 Milestone chart showing time for:

- o Removal, treatment, disposal of inventory

264.113(a)/265.113(a)

- o Decontamination of equipment/structures and soil removal/disposal

- o Closure cover installation

- o Total time to close

264.113(b)/265.113(b)

3.4 Request for extension to deadlines for handling inventory or completing closure

264.113(c)/265.113(c)

CLOSURE PLAN CHECKLIST:

WASTE PILES

EPA I.D.

CLOSURE PLAN CHECKLIST
WASTE PILES*

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
1. FACILITY DESCRIPTION				
1.1 General description (e.g., size, location)	264.111/265.111			
1.2 Topographic map				
1.3 List of other HMM units and wastes handled in each				
1.4 Hydrogeologic information:				
o Ground-water and soil conditions				
o Ground-water monitoring systems				
o Corrective actions				
1.5 Waste piles description:				
o Wastes managed (EPA hazardous waste numbers & quantities)				
o Number and size of waste piles				
o Roof area and containment system design (including engineering drawings)				
o Liner system and leachate collection system design				
o Run-on and run-off control system				
1.6 References to other environmental permits (NPDES, UIC, TSCA)				
1.7 Anticipated waivers or exemptions				
2. CLOSURE PROCEDURES				
2.1 Estimates of maximum quantity of inventory (by waste type) to be removed:	264.112(b)(3)/265.112(b)(3); 264.258(a)/265.258(a)			
o Wastes in piles				
o Leachates				
o Contaminated containment liquids				

* See also Contingent Closure Plan Checklist for permitted waste piles without liner systems as specified in Section 264.251(a) (i.e., single liner)

EPA I.D.

CLOSURE PLAN CHECKLIST
WASTE PILES*

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
2.2 Procedures for handling removed inventory (address quantities, waste types, methods):	264.112(b)(3)/265.112(b)(3); 264.258(a)/265.258(a)			
o On-site treatment				
o On-site disposal				
o Transportation distance off-site				
o Off-site treatment				
o Off-site disposal				
2.3 Procedures for decontamination and/or disposal:	264.112(b)(4)/265.112(b)(4); 264.114/265.114; 264.258/ 265.258			
o Pile base and other equipment/structures decontamination (address sampling protocol)				
o Cleaning agent/rinsewater treatment or disposal (address quantities, waste types, and methods):				
-- On-site treatment/disposal				
-- Off-site treatment/disposal				
o Pile base and other equipment/structures demolition and removal (address quantities and methods):				
-- On-site treatment/disposal				
-- Off-site treatment/disposal				
o Contaminated soil removal:				
-- List or sketch of potentially contaminated areas				
-- Estimated amount of contaminated soil to be removed (address sampling protocol)				
-- Soil removal methods				
-- On-site disposal				
-- Off-site disposal				

* See also Contingent Closure Plan Checklist for permitted waste piles without liner systems as specified in Section 264.251(a) (i.e., single liner)

EPA I.D. _____

CLOSURE PLAN CHECKLIST
WASTE PILES*

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
2.4 Leachate management:	264.112(b)(5)/265.112(b)(5)			
o Estimate of volumes collected				
o Treatment and disposal methods:				
-- On-site				
-- Off-site				
2.5 Ground-water monitoring:	264.112(b)(5)/265.112(b)(5); 264.90; 264.250(c)			
o Number, location and frequency of samples				
o Procedures for analyses				
2.6 Description of security systems:	264.14(b) and (c)/ 265.14(b) and (c)			
o Posted signs and 24-hour surveillance system				
o fence or natural barrier				
2.7 Closure certification:	264.115/265.115			
o Activities to be conducted				
o Testing and analyses to be performed				
o Criteria for evaluating adequacy				
o Schedule of inspections				
o Types of documentation				
3. CLOSURE SCHEDULE	264.112(b)(6)/265.112(b)(6)			
3.1 Expected year of closure	264.112(b)(7)/265.112(b)(7)			
3.2 frequency of partial closures				
3.3 Milestone chart showing time for:				
o Removal, treatment or disposal of inventory	264.113(a)/265.113(a)			
o Decontamination of pile base and equipment/structures				

* See also Contingent Closure Plan Checklist for permitted waste piles without liner systems as specified in Section 264.251(a) (i.e., single liner)

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CLOSURE PLAN CHECKLIST
WASTE PILES*

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT		COMMENTS
			APPLICABLE	APPLICABLE	
o Pile base, equipment, and structures demolition and soil removal/disposal					
o Total time to close	264.113(b)/265.113(b)				
3.4 Request for extension to deadlines for handling inventory or completing closure	264.113(c)/265.113(c)				

* See also Contingent Closure Plan Checklist for permitted waste piles without liner systems as specified in Section 264.251(a) (i.e., single liner)

CLOSURE PLAN CHECKLIST:

LAND TREATMENT

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CLOSURE PLAN CHECKLIST
LAND TREATMENT

SUBJECT REQUIREMENT

PART 264/265

PROVIDED

NOT

APPLICABLE

COMMENTS

1. FACILITY DESCRIPTION

1.1 General description (e.g., size, location)

1.2 Topographic map

1.3 List of other HWM units and wastes handled in each

1.4 Hydrogeologic information:

o Ground-water, soil, and geologic conditions

o Ground-water monitoring systems

o Corrective actions

1.5 Land treatment system description:

o Wastes managed (EPA hazardous waste numbers & quantities)

o Number, size (aerial dimensions and depth), and capacity of each land treatment zone (including engineering drawings)

o Application rates

o Run-on and run-off control systems

1.6 References to other environmental permits (NPDES, UIC, TSCA)

1.7 Anticipated waivers or exemptions

2. CLOSURE PROCEDURES

2.1 Estimates of maximum quantity of inventory by waste type:

o Wastes to be spread at closure

o Run-off from land treatment fields

2.2 Procedures for disposing of inventory and other wastes:

o Procedures for landspreading wastes:

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CLOSURE PLAN CHECKLIST
LAND TREATMENT

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
-- Landspreading management procedures				
-- Application rates				
-- Acreage required				
o Procedures for handling other waste inventory and run-on/run-off (address quantities, types, and methods):				
-- On-site				
-- Off-site				
o Procedures for decontamination and/or disposal:	264.112(b)(4)/265.112(b)(4); 264.114/265.114			
-- Equipment/structure decontamination				
-- Cleaning agent rinsewater/treatment or disposal (address, quantities, and methods such as on-site or off-site)				
-- Equipment/structures demolition (address, quantities, and methods such as on-site or off-site)				
2.3 Procedures to continue land treatment processes:	264.280/265.280			
o Activities to be conducted during closure (disking, liming, irrigation)				
o Procedures for controlling wind dispersal				
2.4 Procedures for contaminated soil removal:				
o List or sketch of potentially contaminated areas				
o Estimated amount of contaminated soil to be removed				
o Soil removal methods				

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CLOSURE PLAN CHECKLIST
LAND TREATMENT

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
o On-site disposal				
o Off-site disposal				
2.5 Procedures for compliance with food-chain crop prohibitions	264.280(a)/265.280(a)			
o Type of crop				
o Analyses to be conducted				
2.6 Vegetative cover design (including engineering drawings):	264.280(a)/265.280(c)			
o Area covered				
o Vegetation characteristics:				
-- Name				
-- Environmental requirements				
o Soil preparation				
2.7 Soil monitoring	264.280(a)(7)/265.280(d)			
o Types of monitoring (soil sampling, soil-pore liquid sampling)				
o Frequency analyses conducted				
2.8 Ground-water monitoring:	264.112(b)(5)/265.112(b)(5); 264.90/265.90;265.280(c)			
o Types of analyses:				
-- Number, location, and frequency				
-- Procedures for analyses				
o Maintenance of equipment				
2.9 Description of security systems	264.14(b) and (c)/ 265.14(b) and (c)			
o Existing facility fence maintenance				
o Additional fencing at closure				
o Other security equipment				
2.10 Survey plat	264.116/265.116			

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CLOSURE PLAN CHECKLIST
LAND TREATMENT

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
2.11 Closure certification:	264.115/265.115			
o Activities to be conducted				
o Testing and analyses to be performed				
o Criteria for evaluating adequacy				
o Schedule of inspections				
o Types of documentation				
3. <u>CLOSURE SCHEDULE</u>				
3.1 Estimated year of closure	264.112(b)(6)/265.112(b)(6)			
3.2 Frequency of partial closures	264.112(b)(7)/265.112(b)(7)			
3.3 Milestones chart showing time for:				
o Landspreading wastes				
o Other waste disposal	264.113(a)/265.113(a)			
o Continued waste degradation				
o Vegetative cover installation				
o Total time to close	264.113(b)/265.113(b)			
3.4 Request for extension to deadlines for handling inventory or completing closure	264.113(c)/265.113(c)			

CLOSURE PLAN CHECKLIST:

LANDFILLS

EPA I.D. _____

CLOSURE PLAN CHECKLIST
LANDFILLS

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
1. FACILITY DESCRIPTION				
264.111/265.111				
1.1 General description (e.g., size, location)				
1.2 Topographic map				
1.3 List of other IHWM units and wastes handled in each				
1.4 Hydrogeologic information:				
o Ground-water, soil, and geologic conditions				
o Ground-water monitoring systems				
o Corrective actions				
1.5 Landfill description:				
o Wastes managed (EPA hazardous waste numbers & quantities)				
o Size (aerial dimensions & depth)				
o Number of landfill trenches or cells (including engineering drawings)				
o Maximum number and size of trenches or cells ever open at any time (existing or proposed)				
o Liner systems				
o Leachate collection systems				
o Run-on and run-off control systems				
1.6 References to other environmental permits (NPDES, UIC, TSCA)				
1.7 Anticipated waivers or exemptions				
2. CLOSURE PROCEDURES				
2.1 Estimates of maximum quantity of inventory by waste type to be landfilled (consistent with land disposal restrictions under Part 268):	264.112(b)(3)/265.112(b)(3)			

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CLOSURE PLAN CHECKLIST
LANDFILLS

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
o Containerized wastes				
o Bulk wastes				
o Decontamination wastes				
o Demolition wastes				
o Contaminated soil (from other activities)				
2.2 Procedures for disposing of inventory and other wastes:	264.112(b)(3)/ 265.112(b)(3)			
o Closure cell construction (including engineering drawings):				
-- Trench excavation & liner installation				
-- Leachate system installation				
-- Run-on and run-off control system				
-- Ground-water monitoring system				
o Procedures for landfilling wastes:				
-- Equipment to be used				
-- Special requirements for incompatible, ignitable, or reactive wastes				
-- Soil, other material, and labor requirements				
o Procedures for decontamination and/or disposal:				
-- Equipment/structure decontamination				
-- Cleaning agent rinsewater/treatment or disposal (address, quantities, and methods such as on-site or off-site)				
-- Equipment/structures demolition (address, quantities, and methods such as on-site or off-site)				

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CLOSURE PLAN CHECKLIST
LANDFILLS

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
o Procedures for contaminated soil removal and disposal (landfilling activities):				
-- List or sketch of potentially contaminated areas				
-- Criteria for determining contamination				
-- Estimated amount of contaminated soil to be removed				
o Procedures for managing incident precipitation:				
-- Amount to be removed from cell and method of treatment/disposal				
-- Amount to be managed via leachate system (after closure)				
2.3 Final cover design (including engineering drawings):	264.310/265.310			
o Area covered				
o Cover characteristics:				
-- Material type				
-- Permeability				
-- Depth				
-- Slope				
-- Drainage structures				
-- Vegetation				
o Installation procedures (equipment and labor requirements)				
2.4 Ground-water monitoring:	264.112(b)(5)/265.112(b)(5); 264.90/265.90			
o Types of analyses:				
-- Number, location, and frequency				
-- Procedures for analyses				
o Maintenance of equipment				

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CLOSURE PLAN CHECKLIST
LANDFILLS

SUBJECT REQUIREMENT

PART 264/265

PROVIDED APPLICABLE NOT
COMMENTS

2.5 Leachate management:

264.112(b)(5)/265.112(b)(5);
264.301(a)(2)

o Estimate of volumes collected

o Treatment and disposal methods:

-- On-site

-- Off-site

2.6 Gas collection and control:

264.112(b)(5)/265.112(b)(5)

o Well location and pipeline configuration

o Gas processing facility

2.7 Description of security systems:

264.14(b) and (c)/
265.14(b) and (c)

o Existing facility fence maintenance

o Additional fencing at closure

o Other security equipment

2.8 Survey plat

264.116/265.116

2.9 Closure certification:

264.115/265.115

o Activities to be conducted

o Testing and analyses to be performed

o Criteria for evaluating adequacy

o Schedule of inspections

o Types of documentation

3. CLOSURE SCHEDULE

264.112(b)(6)/265.112(b)(6)

3.1 Estimated year of closure

3.2 Frequency of partial closures

264.112(b)(7)/265.112(b)(7)

3.3 Milestone chart showing time for:

o Closure cell construction

o Inventory disposal in landfill

264.113(a)/265.113(a)

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CLOSURE PLAN CHECKLIST
LANDFILLS

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
o Contaminated soil disposal				
o Closure cover installation				
o Waste disposal via other methods				
o Total time to close	264.113(b)/265.113(b)			
3.4 Request for extension to deadlines for handling inventory or completing closure	264.113(c)/265.113(c)			

CLOSURE PLAN CHECKLIST:

INCINERATION SYSTEMS

EPA I.D. _____

CLOSURE PLAN CHECKLIST
INCINERATION SYSTEMS

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
1. FACILITY DESCRIPTION				
1.1 General description (e.g., size, location)				
1.2 Topographic map				
1.3 List of other HWM units and wastes handled in each				
1.4 Hydrogeologic information:				
o Ground-water and soil conditions				
o Ground-water monitoring systems				
o Corrective actions				
1.5 Incineration system description:				
o Overall system description (include layout sketch)				
o Wastes managed (EPA hazardous waste numbers and throughput) and chemical and physical characteristics of feed blends (e.g., caloric values, viscosities, chlorine concentration)				
o Combustion unit design type and capacity (i.e., rotary kiln)				
o Waste handling systems design (i.e., pumps, ram feeders)				
o Emission control system (i.e., gas conditioners, scrubbers, cyclones, baghouses, electrostatic precipitators)				
o Residuals handling system (i.e., ash conveyors, scrubber water treatment facilities)				
1.6 References to other environmental permits (NPDES, UIC, TSCA)				
1.7 Anticipated waivers or exemptions				

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CLOSURE PLAN CHECKLIST
INCINERATION SYSTEMS

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
2. CLOSURE PROCEDURES				
2.1 Estimates of maximum quantity of inventory (by waste type) to be removed:	264.112(b)(3)/265.112(b)(3)			
o Containerized wastes				
o Bulk liquid wastes				
o Bulk solid wastes				
o Incineration residuals (ash, scrubber effluents)				
2.2 Procedures for handling wastes to be incinerated on-site:	264.112(b)(3)/265.112(b)(3); 264.345/265.345			
o Quantities				
o Waste types				
o Operating conditions (address auxiliary fuel requirements, time to incinerate)				
o Monitoring and inspection activities	264.347/265.347			
2.3 Procedures for handling wastes not to be incinerated, including incinerator ash and scrubber effluents generated during closure (address quantities, types, and methods):				
o On-site treatment/disposal				
o Off-site transportation				
o Off-site treatment/disposal				
2.4 Procedures for decontamination and/or disposal:	264.112(b)(4)/265.112(b)(4); 264.351/265.351			
o Equipment/structures decontamination (address sampling protocol)				
o Cleaning agent/rinsewater treatment or disposal (address quantities, waste types, and methods):				
-- On-site treatment/disposal				

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CLOSURE PLAN CHECKLIST
INCINERATION SYSTEMS

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
-- Off-site treatment/disposal				
o Equipment/structures demolition and removal (address quantities and methods):				
-- On-site treatment/disposal				
-- Off-site treatment/disposal				
o Contaminated soil removal:				
-- List or sketch of potentially contaminated areas				
-- Estimated amount of contaminated soil to be removed (address sampling protocol)				
-- Soil removal methods				
-- On-site disposal				
-- Off-site disposal				
2.5 Description of security systems:	264.14(b) and (c)/ 265.14(b) and (c)			
o Posted signs and 24-hour surveillance system				
o Fence or natural barrier				
2.6 Closure certification:	264.115/265.115			
o Activities to be conducted				
o Testing and analyses to be performed				
o Criteria for evaluating adequacy				
o Schedule of inspections				
o Types of documentation				
3. CLOSURE SCHEDULE				
3.1 Estimated year of closure	264.112(b)(6)/265.112(b)(6)			
3.2 Frequency of partial closures	264.112(b)(7)/265.112(b)(7)			

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CLOSURE PLAN CHECKLIST
INCINERATION SYSTEMS

SUBJECT REQUIREMENT

PART 264/265

PROVIDED NOT
APPLICABLE COMMENTS

3.3 Milestones chart showing time for:

o Incineration or removal, treatment and disposal of inventory (and incineration residuals)

264.113(a)/265.113(a)

o Decontamination equipment/structures

o Equipment, structures demolition and soil removal/disposal

o Total time to close

264.113(b)/265.113(b)

3.4 Request for extension to deadlines for handling inventory or completing closure

264.113(c)/265.113(c)

CONTINGENT CLOSURE PLAN CHECKLIST:

**CERTAIN TANK SYSTEMS, WASTE PILES, AND
SURFACE IMPOUNDMENTS**

EPA I.D. _____

CONTINGENT CLOSURE PLAN CHECKLIST
CERTAIN TANK SYSTEMS, WASTE PILES, SURFACE IMPOUNDMENTS

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
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1. CLOSURE PROCEDURES

1.1 final cover design (including engineering drawings):

264.310/265.310

o Area covered

o Cover characteristics:

-- Material type

-- Permeability

-- Depth

-- Slope

-- Drainage structures

-- Vegetation (type, soil preparation procedures)

o Installation procedures (equipment and labor requirements)

o Erosion control procedures

1.2 Ground-water monitoring:

264.112(b)(5)/265.112(b)(5);
264.90/265.90

o Well installation:

-- Number, location, and depth of wells

-- Method of construction

o Types of analyses:

-- Number, location, and frequency

-- Procedures for analyses

o Maintenance of equipment

1.3 Description of security systems:

264.14/265.14

o Existing facility fence maintenance

o Additional fencing at closure

o Other security equipment

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CONTINGENT CLOSURE PLAN CHECKLIST
CERTAIN TANK SYSTEMS, WASTE PILES, SURFACE IMPOUNDMENTS

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
1.4 Survey plat	264.116/265.116			
2. CLOSURE SCHEDULE	264.112(b)(6)/265.112(b)(6)			
2.1 Milestone chart showing time for:				
o Closure cover installation				
o Vegetation planting				
o Total time to complete closure	264.113(b)/265.113(b)			
2.2 Request for extension to deadline for completing closure	264.113(c)/265.113(c)			

POST-CLOSURE PLAN CHECKLIST

EPA I.D. _____

POST-CLOSURE PLAN CHECKLIST

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
1. <u>GROUND-WATER MONITORING</u>	264.118(b)(1)/265.118(b)(1); 264.310(b)/265.310(b); 265.90/265.90			
1.1 Number, location, and depth of wells				
1.2 Frequency of sampling				
1.3 Types of analyses to be conducted				
1.4 Procedures for sampling and analyses (including party responsible)				
2. <u>SOIL MONITORING</u>	264.118(b)(1)/265.118(b)(1); 264.280(d)(1)/265.280(d)(1)			
2.1 Number and frequency of samples				
2.2 Types of analyses to be conducted				
2.3 Procedures for sampling (including party responsible)				
3. <u>LEACHATE MONITORING AND REMOVAL</u>	264.118(b); 264.310(b)(2)			
3.1 Monitoring procedures and frequency of monitoring				
3.2 Estimated quantity of leachate				
3.3 Procedures for collecting and removing leachate				
3.4 Procedures for treatment and disposal:				
o On-site				
o Off-site				
3.5 Party responsible				
4. <u>INSPECTIONS</u>	264.118(b)(2)/265.118(b)(2)			
4.1 List of structures and facilities to be inspected				
4.2 Frequency of inspections				
4.3 Party responsible				

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POST-CLOSURE PLAN CHECKLIST

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
5. MAINTENANCE ACTIVITIES	264.118(b)(2)/265.118(b)(2); 264.310(b)/265.310(b)			
5.1 Maintenance of final cover:				
o Mowing and fertilizing				
o Replacing lost soil and reseeding				
o Maintaining drainage channels and culverts				
o Controlling rodents and insects				
o Contingency plans for damage caused by severe storms or natural events				
5.2 Maintenance of monitoring systems:				
o Monitoring well replacement/redrilling				
o Sampling pump replacement				
o Other equipment maintenance				
5.3 Maintenance of security systems:	264.117(c)/265.117(c)			
o fence, warning signs, and gates maintenance				
o Responsible party				
6. CONTINUATION OF LAND TREATMENT PROCESSES	264.280/265.280			
6.1 Procedures for continued degradation of hazardous constituents (disking, fertilizing, liming, irrigation)				
6.2 Procedures for controlling run-on and run-off:				
o Drainage system and erosion repair				
o Run-off quantities and handling methods				
6.3 Procedures for controlling wind dispersal of particulates				

POST-CLOSURE PLAN CHECKLIST EPA I.D. _____

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOI	APPLICABLE	COMMENTS
6.4 Procedures to determine level of hazardous constituents in the treatment zone: <ul style="list-style-type: none">o Identification of constituentso Number and location of sampleso Types of analyseso Statistical methods					
7. POST-CLOSURE NOTICES					
7.1 Record of wastes: <ul style="list-style-type: none">o Sources of informationo Types of information to be included	264.119/265.119				
7.2 Notation on deed: <ul style="list-style-type: none">o Schedule for filing noticeo Location of filing					
7.3 Name, address, and phone number of contact person					
8. POST-CLOSURE CERTIFICATION					
8.1 Estimated number of inspections	264.120/265.120				
8.2 Testing and analyses to be performed					
8.3 Types of documentation					

